

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

Founded in 1909

FIRST AERONAUTICAL WEEKLY IN THE WORLD

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

No 1384 Vol. XXVIII

JULY 4, 1935

Thursdays, Price 6d.
By Post, 7½d.

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: *Truditur*, *Sedist*, London.

HERTFORD ST.

COVENTRY.

Telegrams: *Autocar*, Coventry.
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SUBSCRIPTION
RATES:

Home and Canada: Year, £1 13 0.
Other Countries: Year, £1 15 0.

6 months, 16s. 6d.
6 months, 17s. 6d.

3 months, 8s. 3d.
3 months, 8s. 9d.

The Hendon Display

OME good events, no bad ones, but a general lack of snap, and a consciousness of drag; these are the main impressions left by the R.A.F. Display of 1935. We are, of course, judging by a very high standard, the standard set by previous displays. By that standard, quite good events which might have been better, and have been better in previous years, must come in for some criticism.

In the first place, it should be made clear that very little of the criticism applies to the actual flying of the pilots and squadrons; it was the stage management which was at fault in certain cases. It is also desirable to distinguish between events which cannot be made actually spectacular but which are introduced rightly for other reasons, and those which ought to be spectacular above everything else. In the first class we may instance the air gunnery training, the flying by the "Comet," the parade of the flying boats, and the demonstration by Home Defence units. It was a very good thing to have all of these events in the programme. Theatrical managers have sometimes drawn large houses by hiring some person whose name has been much in the papers just to sit on the stage for people to see, without doing anything in particular. At Hendon it is not possible to show the "Comet" flying non-stop from Mildenhall to Baghdad at 200 m.p.h., but very many of the crowd at Hendon on Saturday will have gone home gratified at having seen the winner of the Australia race in the air. In the same way, the very good air drill by No. 19 (Fighter) Squadron was, in itself, less interesting than the sight of nine "Gauntlets" in formation. The Observer Corps, and the searchlight sappers could do nothing spectacular on Saturday afternoon, but it was none the less a good thing to demonstrate to the public that they do perform public services unpaid. For such items no criticism would be justified.

Other items are mainly intended to be spectacular, even though they may have their useful or instructive

side. Refuelling in the air is certainly an interesting thing to see once, but after contact has been made the two machines need not go on flying round and round. The so-called instructional flying by instructor and pupil was very amusing the first time it was shown. So was crazy flying; so was the formation of Pterodactyl, Autogiro, and Gugnunc; so was the bursting of comic balloons. These have all been left out of the programme now as having got stale, and it is about time that the instructor and pupil act was also discarded. On no grounds should we plead for the elimination of the message-picking-up by the army co-operation squadrons, but the number of runs should be cut down.

An Uninspiring Fly-past

Air drill by a wing of bomber squadrons has sometimes been the most striking feature of the whole Display. This year the distance between the squadrons was too great, and there was too much time between each run when there was nothing to watch. In the final fly-past the same fault of too great a distance between the units was noticeable, and there was really nothing imposing about the event at all. The flight aerobatics were exceedingly well performed, and the flight roll has never been done better, but it was done far away from the centre of the aerodrome. The machines with coloured smoke had a great opportunity and sometimes they did produce very effective patterns, but they seemed to attempt too much, there was the same time-lag which characterised other items in this Display, and often the groundwork had disappeared before the pattern had been woven in. Inverted flying is another event which calls for tremendous skill and no little endurance on the part of highly skilled pilots, but one cannot watch it year after year with unwanted enjoyment.

One complete novelty in this year's Display was the interval of time between some of the events. Hitherto, they have followed one another with a promptitude which has aroused admiration and kept interest alive. The pilots and the squadrons kept rigorously to the time-table set, but it was the time-table itself which allowed

a certain amount of ennui (never before experienced at Hendon) to creep in. The broadcaster did his best to fill in the gaps, but he laboured under difficulties. Next year the stage manager will have to make things more snappy if he does not want the popularity of the Hendon Display to grow deplorably less.

The West Indies

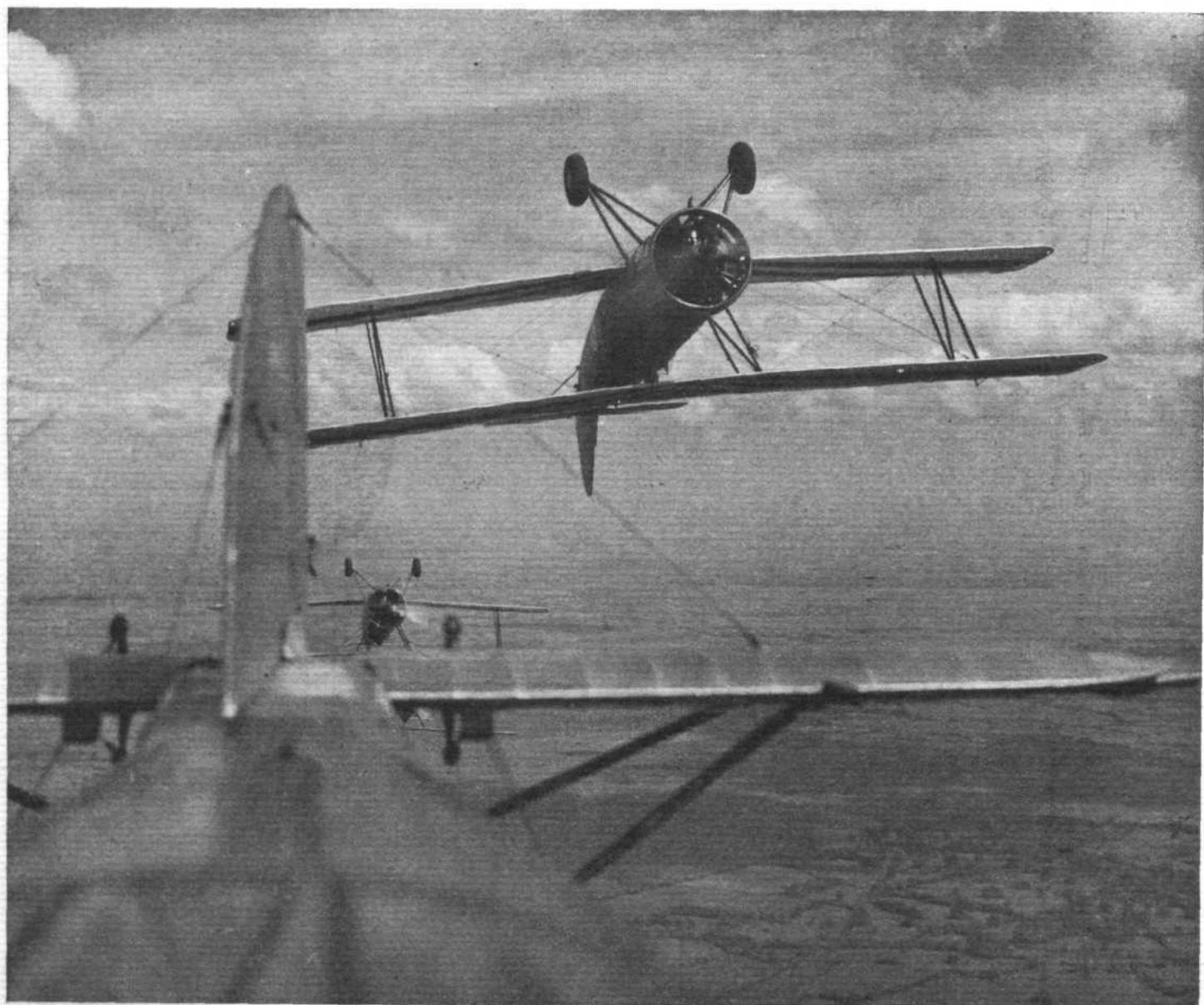
If it be accepted that the most promising routes for pioneer air services are those where the ground or surface communications are indifferent, an archipelago would seem to be the ideal place for air transport on a modest scale to make good. Of all archipelagoes, that in which the British ought to take most interest is the semi-circle of the West Indies. The normal means for inter-island communication are steamships, which are slow at the best, and cannot visit all the islands as often as the interests of the West Indians would dictate. There seems to be in the West Indies a great chance for flying boat services.

The idea is not novel, for in the first year after the Armistice Major Hemming and others formed a company to operate flying boat services in the West Atlantic

with the Bermudas as the main base. Now Pan-American Airways include some of the West Indies on their southward route. It is not a pleasant thought, not a credit to the British Empire, that we should leave air services among these British islands to foreigners.

A correspondent in the West Indies has recently sent to *Flight* the outline of a scheme for running a weekly service with "Cloud" amphibians between Trinidad and San Juan in Porto Rico, calling at intermediate islands, with a weekly shuttle service with a "Windhover" between Barbadoes, Trinidad, and Georgetown in British Guiana. Mostly the boats would be able to fly without their landing gear. The figures quoted appear to be very conservative, allowing for a very minimum of passengers and mails at the start, and it is concluded that a subsidy of £15,000 per annum would cover the initial working loss.

The scheme holds out prospects of great developments in the future, for it might well grow to include Jamaica, British Honduras, the Bermudas, and perhaps ultimately an extension to Canada. The prospect is interesting, and we might add tempting, and it certainly deserves consideration by the Director General of Civil Aviation.



INVERSION AT CLOSE QUARTERS. Something the Hendon Display spectators did not see—what the inverted Avro "Tutors" of the Central Flying School look like from another machine only a few yards distant.

The Outlook

A Running Commentary on Air Topics

The Aero Show

OF the popularity of the S.B.A.C. Display and Exhibition there can be no doubt whatever. The large number of foreign visitors were pleased with what they saw at Hendon last Monday and, as in previous years, there is every indication that the British aircraft industry will have made very useful contacts and that substantial orders will flow to this country directly and indirectly as a result of the show.

From conversation with a considerable number of foreign visitors we are, however, convinced that one day is not sufficient for this kind of aero show. Few of the foreign visitors can meet the people they wish to meet, see the products they wish to see and really get down to solid business in one day. From several sides we heard the opinion voiced that the S.B.A.C. Display and Exhibition are altogether admirable in their character. They combine the flying and "static" sides in a manner which no ordinary aero show can approach. But the time is too short, and in future it seems essential that three days should be set aside for this event. That there may be difficulties in obtaining the use of Hendon aerodrome is realised. If these cannot be surmounted it will be necessary to find another aerodrome, even at the risk of having to stage the "static" exhibits in temporary hangars.

Speed or Comfort?

ALTHOUGH it is a fact, as Imperial Airways have proved, that over comparatively short distances it is possible to sell comfort, speed and safety in that order, there is little doubt that speed over longer distances is actually synonymous with comfort.

Travellers, in fact, will prefer to spend three hours in a machine which provides fair comfort rather than five or even six hours in a more superlative affair. Swissair's smaller capacity Douglas machines are always booked up on the Zurich run in at least one direction in advance, though Imperials, with whom they collaborate, are also carrying good loads. It is, however, difficult to generalise when the two services are run at different times of the day.

At the conclusion of a year's operations matters will have evened up and, taking into account those passengers who may have been turned away or turned at least from one service to another, each company will be able to compare both traffic and "profit" figures with instructive results.

The Long-distance Problem

WHEN one considers an air route involving thousands of miles the problem becomes more involved. In a period of eight to ten hours a really fast and moderately comfortable machine will cover a distance which the slower craft will only cover, when neglecting the probable necessity for more frequent refuelling, in thirteen to fifteen hours.

Will the passenger, in fact, prefer to fly almost non-stop from 9 a.m. until 6 p.m., or to fly in stages of three or four hours, with ample meal stops, during both day and night? Most people, one imagines, will prefer the first alternative.

Again, however, one cannot take specific examples, for it is quite obvious that, under present circumstances at any rate, Imperials cannot afford to scrap an entire fleet in order to compete with K.L.M. on the Eastern route.

Flying High

ON all but short journeys it is the accepted thing for commercial machines to fly high. A matter of four or five thousand feet will usually suffice to give the passengers an extremely comfortable trip under ordinary conditions, but machines such as the Douglas ought to be flown at eight or more thousand feet if they are to be operated with maximum efficiency.

In these circumstances it is necessary to consider the passenger—who is not always one likely to be able to pass the "B" licence medical test!—very much more carefully. A rapid descent from such a height can cause a good deal of distress. In America, Department of Commerce regulations ordain a maximum rate of descent of four hundred feet a minute.

This might appear to be obvious to everyone in the business, but last week we met a passenger who was brought down from something like fourteen thousand feet in a matter of ten or fifteen minutes and he was not at all happy. It is comforting to know that, despite this sudden baptism and the fact that it was his first flight of any magnitude, he claims that he will never travel by any other form of transport so long as an air service is available.

Four Licences?

WITH the continued increase in the use of the aeroplane the necessity for the further subdivision of pilot's licences is becoming more obvious and the G.A.P.A.N. is working out its suggestions. Already a limited "B" licence is an immediate possibility and a transport licence will probably be available before long.

So within a year it would appear that we shall have the "A" licence for ordinary pilots, a limited "B" licence for instruction, demonstration and joy-riding, a "B" licence and a transport pilot's licence. The last will probably resemble the Master Pilot's Certificate inasmuch as experience will be the main qualification.

Combating Ice Formation

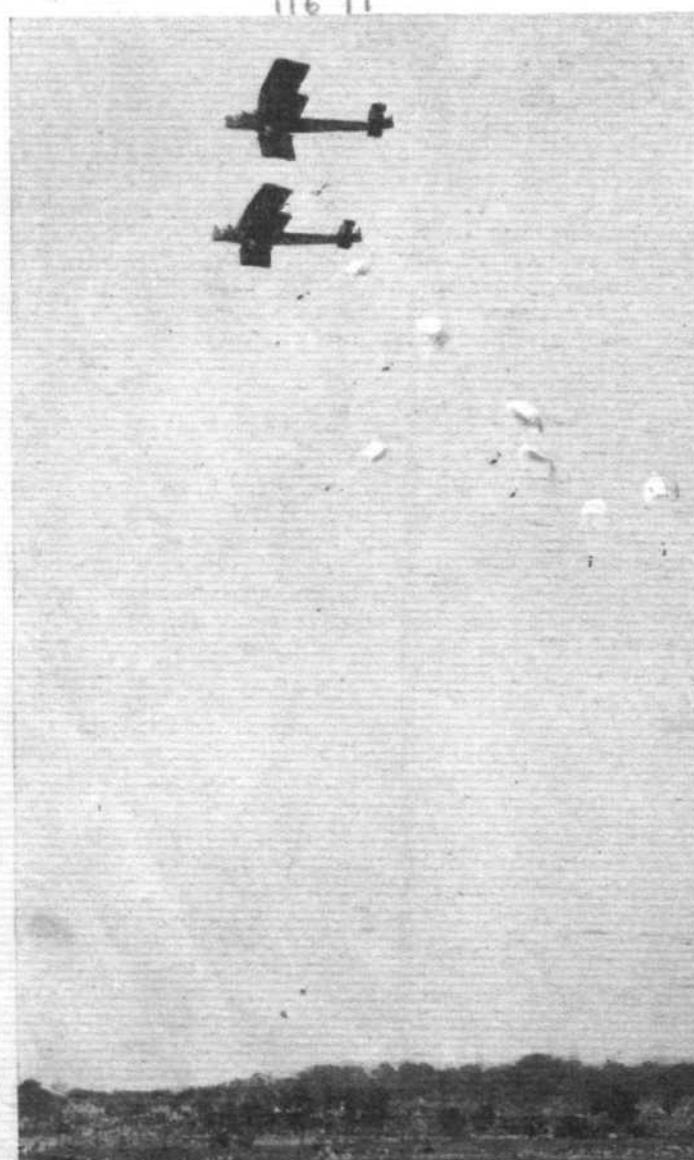
JUST as we were beginning to wonder whether the airline operators would find it necessary to go to America for their de-icing equipment, a British firm has introduced an example on entirely new lines. Since learning, more than a year ago, that the R.A.E. was experimenting with the particular principle behind this device, we have felt that prevention rather than cure was the ideal to be aimed at, and the new equipment appears to start its work at the foundations.

Any mechanical or pneumatic system for breaking the *formed* ice is necessarily a makeshift solution to the problem, though, judging by reports, the equipment used by Transcontinental and Western Air appears to do its work satisfactorily under operating conditions. It remains to be seen whether this prevention is more satisfactory than the cure previously applied. Certainly the development will take a heavy load off the minds of transport pilots. Anyone who has watched clear ice forming on the leading edges will sympathise with the pilot pushing on, at, perhaps, an ordered altitude in ice-forming conditions.

The problems of airscrew and pitot head protection are the next to be tackled, though a form of electrical heating will counter the risk of icing-up in the latter case. All instrument venturis should in any case, be arranged inside engine cowling—or, alternatively, mechanical pumps should be provided.



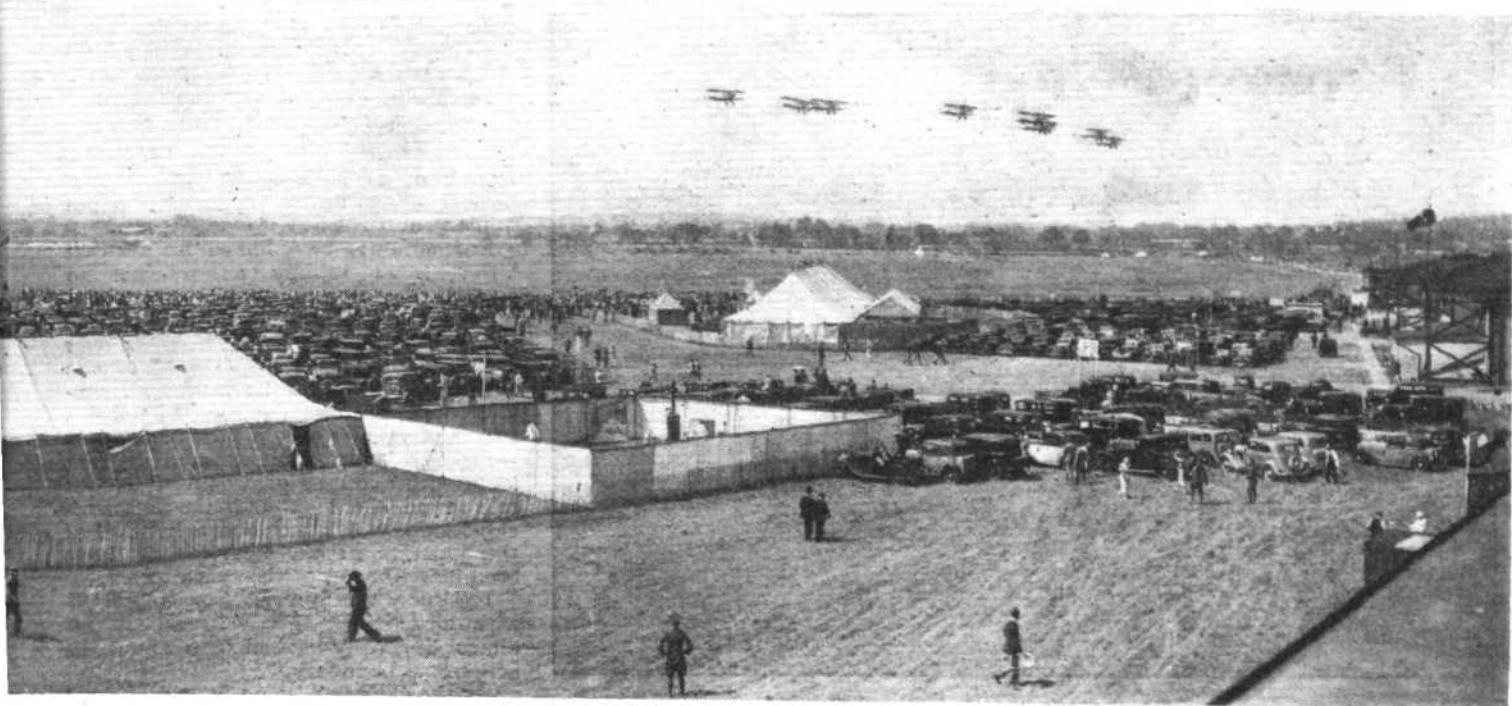
(Above) : A remarkable panorama looking northward across the aerodrome. Every one of the public enclosures was packed almost to capacity with humanity and motor cars.
 (Below) : Picturesque, if not exciting—sixteen Irvin parachutes, carrying 200-lb. weights, being dropped from Vickers "Virginias" of the Home Aircraft Depot.
 (Flight photographs.)



THE SIXTEENTH

*Tens of Thousands of Visitors Once Again
Work and Train in the*

BEAUTY and discipline are the two keynotes of every R.A.F. Display, and on Saturday H.R.H. the Duke of Kent, the representatives of a score of countries, and many thousands of His Majesty's subjects heard both notes struck firmly and resonantly. It needs only a background of blue sky, and the manœuvres of the silver aeroplanes, the white, fluttering parachutes, the trails of gaily coloured smoke, and the puffs of simulated shell bursts cannot fail to create beauty. The sky on Saturday played its part, and not even the most fanatical Zoroastrian could



A.F. DISPLAY

the Annual Culmination of the Royal Air Force

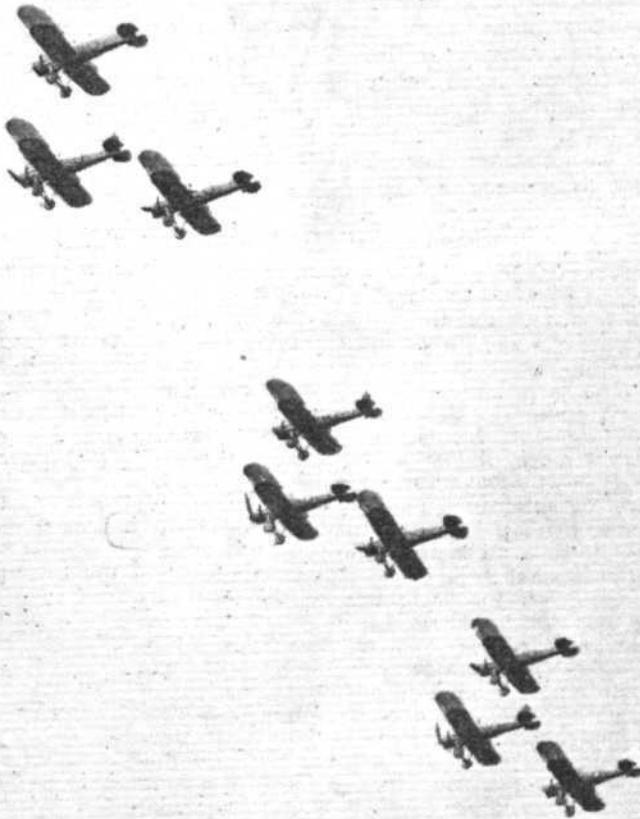
have wished for more sun-power. The Display, in short, was a gorgeous spectacle, dazzling all eyes with every variety of flashing, glimmering, floating argent against a background of blazing azure.

As for discipline, the whole organisation tells the tale of order, method, and controlled power. One incident stood out on Saturday which spoke volumes for the discipline of the Royal Air Force. The pupil-and-instructor act has its serious side, but at Hendon it is always presented as a clever piece of clowning. Just after the take-off the supposed pupil over-acted his part a trifle while too near the ground, and crumpled up his yellow "Tutor." Almost before people had time to realise that the pilot was unhurt, another yellow "Tutor" took off, and the turn was carried through as though no hitch had happened. That is the way of the Royal Air Force in peace: it would be just the same in war.

Beauty and discipline are not, however, the only things needed to hold the attention of a large crowd. This year's Display was inclined to drag, and the stage management was not so good as in former years. However, there were high lights in it. One was the unfailing resource of the broadcaster, who was dismayed by nothing, and when an interval between events threatened to grow unduly long kept his commentary going, and contrived to interest the crowd. The event called Tactical Training was a happy idea, and was both interesting and instructive. It was weird to hear (through the loud speakers) the flight leaders talking to each other when both were in the air, and laying their plan of attack on the bombers, and the words came through the speakers with quite sufficient clearness.

We were given, too, an object-lesson in the different tactics which may be used by single-seater and two-seater fighters. When the flight of No. 1 F.S. came up to help the flight of No. 23 F.S., the three Hawker "Demons" ceased their ordered disorder, and took station below and in front

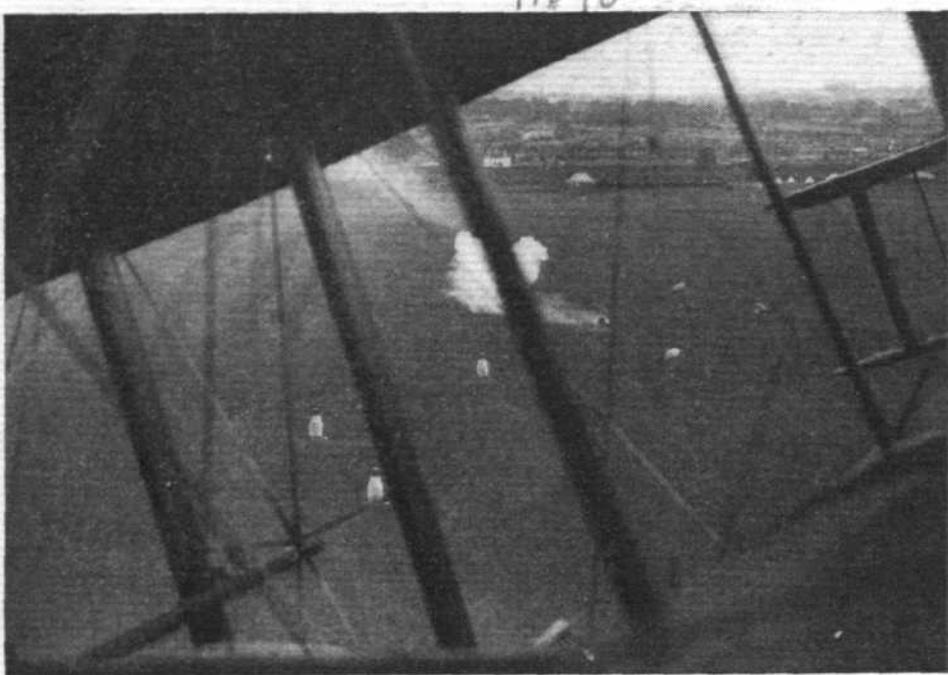
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The comparative silence of the Gloster "Gauntlets" of No. 19 (F.) Squadron was generally commented upon when they carried out squadron air drill. (Flight photograph.)

of the three "Wallaces" of the City of Bristol Squadron, the rear gunners in the "Demons" keeping up a steady fire on the bombers, while up above the "Furies" took up the diving attack. Strangely enough, it was at that moment, when the "Demons" seemed in a place of absolute safety, that one of them apparently succumbed to spontaneous combustion, and went down (to quote Lewis Carroll) "reeling and writhing and fainting in coils."

The Display Committee showed that they, too, were not

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The pilot's view of "Air skittles"—an ever-popular item carried out by "Virginiæ." The smoke from the bomb which has just burst can be seen. (Flight photograph.)

Squadron, as he sang out the instrument readings on his way into and out of manœuvres—or even during them.

Furthermore, he climbed his Hawker "Fury" as rapidly as possible to 5,500ft., found the one and only cloud in the sky, hid behind it, and dived so that for a few seconds only his voice over the speakers and the gathering scream of his descent could be heard. Thereafter, he carried out his upward rolls—a source of wonder only a year or two ago—rocket, figure-of-eight and rolling loops with expected precision. Both the roll round the loop and the figure-of-eight loop, which included a half-roll at the junction of the figure, must have been new to most of the spectators.

The show was impressively completed with a demonstration of speed in an almost vertically-banked turn round the aerodrome boundary.

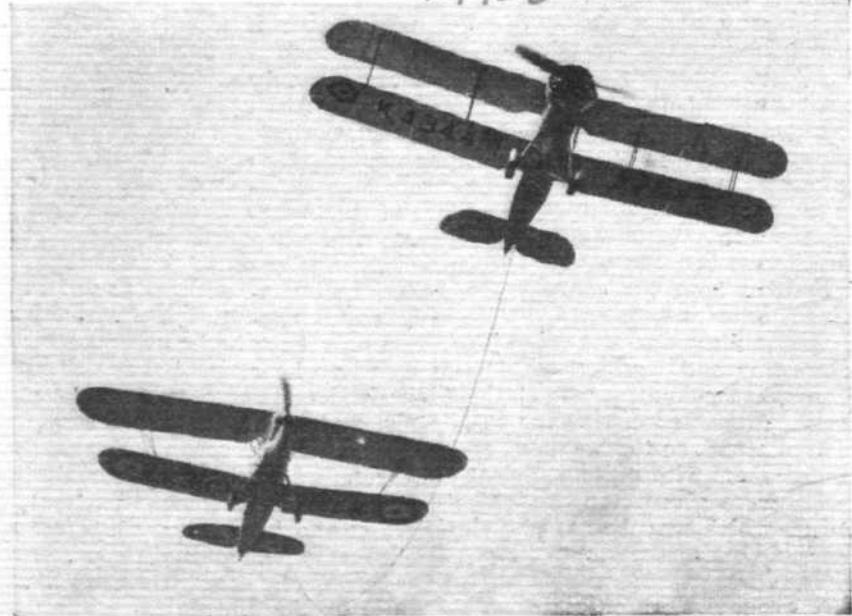
As the "Fury" came in, a Westland "Wallace" ("Pegasus IM₃") and Hawker "Hart" ("Kestrel IB") from the Royal Aircraft Establishment took the stage for the refuelling demonstration, being individually introduced by the announcer, rather in the manner of prize-fighters. The two then joined forces, the "Wallace" just above and to windward of the "Hart," and when the pilots (Flt. Lts. J. A. T. Ryde and F. R. D. Swain respectively) had the machines placed to a nicety the "Wallace" let out a line, which was caught at the first attempt by the "Hart"; the fuel pipe was then pulled across and coupled up without incident.

With the pipe-line bent in a semi-circle between them by the airstream the two proceeded to make four or five circuits of the aerodrome. This seemed to take an unconscionable amount of time, but, since realism is aimed at in all the Display items, one must be charitable and assume that sixty-odd gallons of the best really were transferred from tanker to tanke via the 1½in. pipe. The casting-off and winding-in of the pipe was accomplished as slickly as the coupling-up.

Even after making up one's mind that the instructional flying event, by No. 2 F.T.S., was an excuse for a little mild crazy flying, the initial craziness of the "pupil," F/O. I. V. Hue-Williams was incredible to behold. No instructor should have allowed him to go solo. However, after wallowing all over the place he made a steep and harrowing turn in front of the enclosures and sat the "Tutor" down firmly at full throttle—and certainly stalled—to give the assembled Press photographers a perfect picture of a *very* heavy landing.

In keeping with the "carry-on" tradition for which the

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Hand-in-hand : The Westland "Wallace" and Hawker "Hart" during the refuelling demonstration. The pipe is just being drawn on board the "Hart." (Flight photograph.)

incapable of imagination when they staged an event in, which all the units taking part were unpaid volunteers, one squadron of the Auxiliary Air Force, a group of the Observer Corps, and searchlights, sound-locators, and guns of the Territorial Army. The searchlight people are like that famous Astronomer Royal who "disapproved of daylight altogether," and they must simply have hated the glorious sunlight of Saturday. The gunners, however, had a fine time.

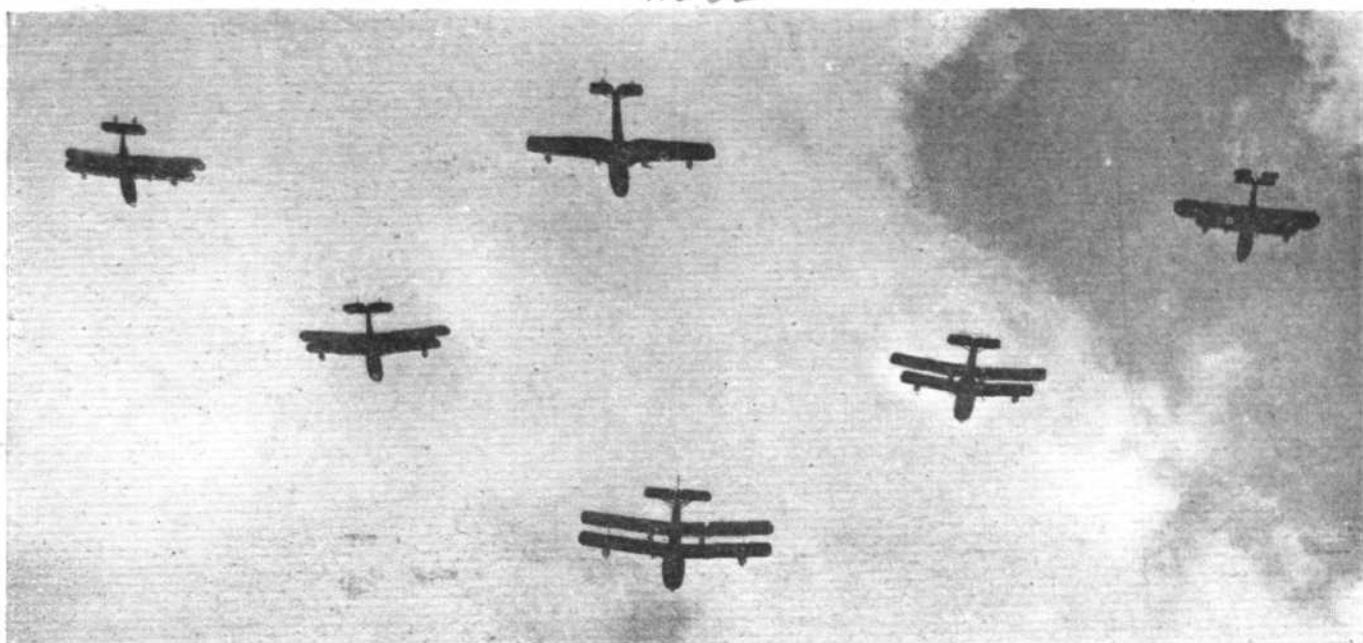
But we must get down to details, for there is much of interest to recount.

The Headquarters Race

Every year the preliminary part of the programme starts with what is called the Headquarters Race. This year it was confined to a senior officer from the Air Ministry and from each Command and Formation Headquarters. The pilots were very senior officers—with one exception, nobody was of lower rank than a wing commander—but youth evidently tells, because the winner was the exception, the only flight-lieutenant in the race—Flt. Lt. G. N. Stanley-Turner, of No. 1 Air Defence Group, flying a Westland "Wapiti" ("Jupiter VIIIF/P") at an average speed of 112.5 m.p.h.

From the spectators' point of view it was a dull race, just a 28-mile two-lap handicap, with the machines out of sight part of the time. The only mild thrill was when a "Nimrod" from the Coastal Area overtook an "Audax" of the Inland Area right over the enclosures on the west side of the aerodrome. The finish was very tame, as a "Heyford" of the Western Area appeared to be running away with the race, with the "Wapiti" next after him, comfortably ahead of the rest of the field. The results, announced some twenty minutes later, showed that the "Heyford," and the "Nimrod" which crossed the line third, were disqualified; this left a "Hart" of the Air Ministry, flown by Wing Cdr. R. Graham, second after the "Wapiti" at 148.25 m.p.h., and a "Hart" of the Central Area, flown by Wing Cdr. P. H. Cummings, third at 148.5 m.p.h.

Those individuals who have become somewhat blasé by reason of a yearly attendance at Hendon should, by exercising a little imagination, have derived a new kind of thrill from the display of individual aerobatics. Those who were near the loud-speakers and who possessed "radio" ears must have enjoyed the experience of listening to the pilot, F/O. J. W. Donaldson, of No. 1 (F.)

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The flying boats : In the vee, left to right, are the Vickers-Supermarine "Scapa" and "Stranraer," Short "Sarafand" and "Singapore III," and Saro "London"; bringing up the rear is the Saro "Cloud." (Flight photograph.)

R.A.F. is famous, a new "pupil" was in the air almost before the first had stepped—fortunately unhurt—out of the wreckage, the announcer continued his commentary and all the crash and fire equipment which had raced towards the remains removed them and foamed the petrol-soaked ground almost before people realised that a crash had taken place.

Pupil No. 2 was bad, but only as bad as a really panic-stricken first soloist might be. His cross-wind take-off was just careless, his loop became a stalled turn—obviously he had never done a dual loop—his half-roll off the top of a loop was nothing but a climbing-cum-stall turn, and, of course, he got in the way of the instructor—F/O. R. G. C. Arnold—when the latter was landing.

The final landing was the real masterpiece of the event to the eyes of those spectators who can still remember their early attempts. The "Tutor" was brought in fast and off the wind, turned into wind and was then levelled off too violently. Three times the pupil "ballooned" with great realism, and finally "pump-handled" to a landing when the elevators had finally lost their ability to send the machine once more into the air. He used, in fact, the entire aerodrome in the accepted style and probably had to use his brakes, too.

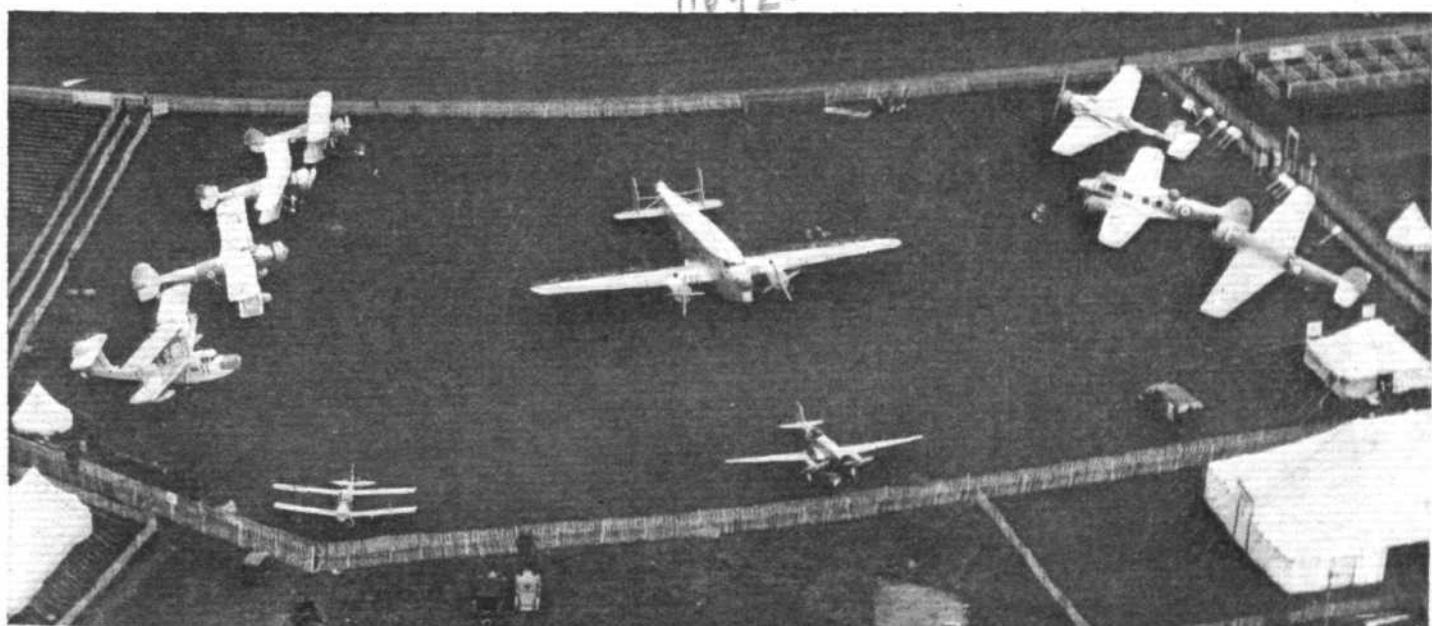
For the benefit of three Hawker "Fury" pilots desirous of getting in some practice with their twin Vickers guns, an

obliging Fairey "Gordon" sailed along over the aerodrome towing a canvas sleeve target on 200 yards of steel cable. Actually, the event was intended to illustrate how pilots are trained in machine gunnery against air targets.

Breaking from flight formation above and astern of the target the "Furies" attacked. Their leader dived, fired a burst and pulled up in a rocket loop, getting into position for a second dive. The remaining two "Furies" attacked from the quarter, one passing above and the other diving below the sleeve. As the "Gordon" repeated its run over the aerodrome in the opposite direction the fighters approached in echelon starboard. They dived as a flight and made a beam attack in succession. Then, before taking up formation, the leader attacked from below and the others from both sides.

It was a thoroughly instructive show. The "Gordon" was from No. 3 Armament Training Camp, and the "Furies" belonged to No. 25 (F.) Squadron.

For purposes of spectacle the Boulton Paul "Overstrand" from No. 101 (Bomber) Squadron failed to live up to its reputation for fighting as it flies, "straight to the bombing objective," but, when attacked by three Hawker "Furies" of No. 25 (F.) Squadron, looped and stall-turned in a shameless fashion. One doubts if there is any large twin-engined bomber



A low-altitude aerial view of the "New and Experimental" park. The big machine in the centre, dwarfing the D.H. "Comet" in front of it, is the A.-W. bomber transport. (Flight photograph.)

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The Hawker "Harts" of No. 15 (Bomber) Squadron at the bottom of their dive across the aerodrome after the Air Drill event, in which they co-operated with Nos. 18 and 57 (B.) Squadrons. (Flight photograph.)

in the world, however fast, which is more manœuvrable than the big Boulton Paul.

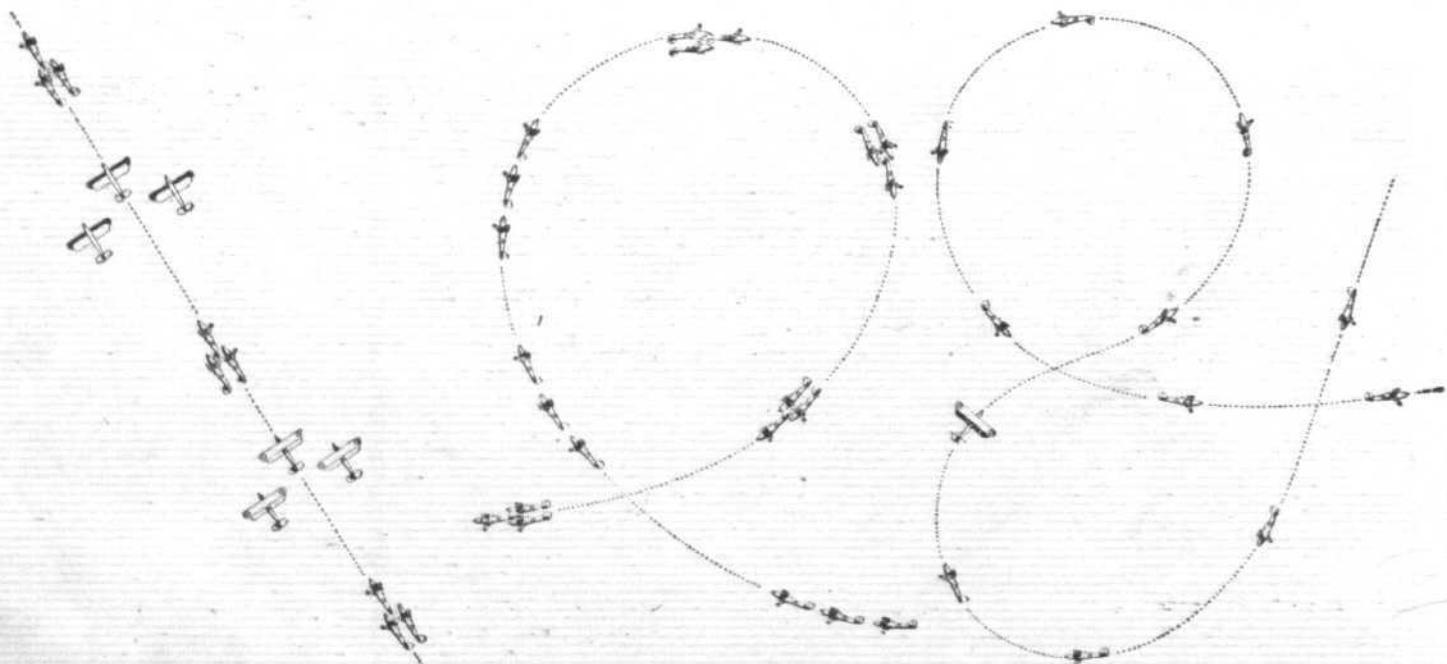
It approached Hendon, where it was engaged by the three "Furies," under heavy "Archie" fire. One "Fury" fell early in the battle. Flying Officer G. J. L. Read kept the "Overstrand" in tight turns and, when things began to get really hot, in tight loops and stalled turns also. But a "Fury" got in a fatal burst as the big bomber was finishing a loop, and down it tumbled, trailing a stream of stannic smoke. One "Fury" just *had* to make absolutely certain, and kept hammering away at the doomed "B.P." to within a few hundred feet of the ground.

There must have been something in the air which made the aeroplanes look slower than they actually were. Certainly, it was not the wind, which was very light. Even the De Havilland "Comet" did not give an impression of 230 m.p.h. or so, although it must have been doing quite that at times. F/O. A. J. Pegg, one of the Martlesham pilots, took it off

in about ten seconds, using but a third or so of the aerodrome. After turning outside the aerodrome he came across down-wind, made a half-turn to the left while climbing slightly and then repeated the down-wind run. Approaching again against the wind he gave a demonstration of flying with one engine throttled right down, the "Comet" obviously holding its height easily with the, presumably, light load it carried.

Most impressive, curiously enough, and far more so than the speed were the figures-of-eight carried out within the aerodrome boundaries. For a machine designed for racing the "Comet" was shown to be very manœuvrable. The slow flying with wheels down indicated that this machine has a very wide speed range, and the landing was faultless, the pilot pulling up to a standstill in the centre of the circle and then taxiing into the aircraft park.

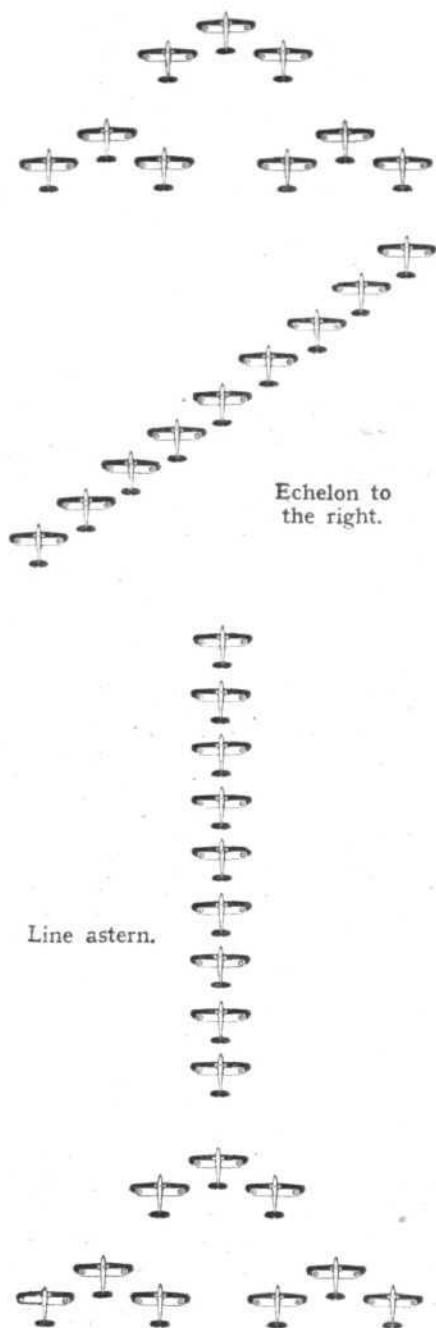
Rapidity is the first essential of everything in air defence, and the last item of the preliminary programme showed the spectators an example of how speedily things are done by



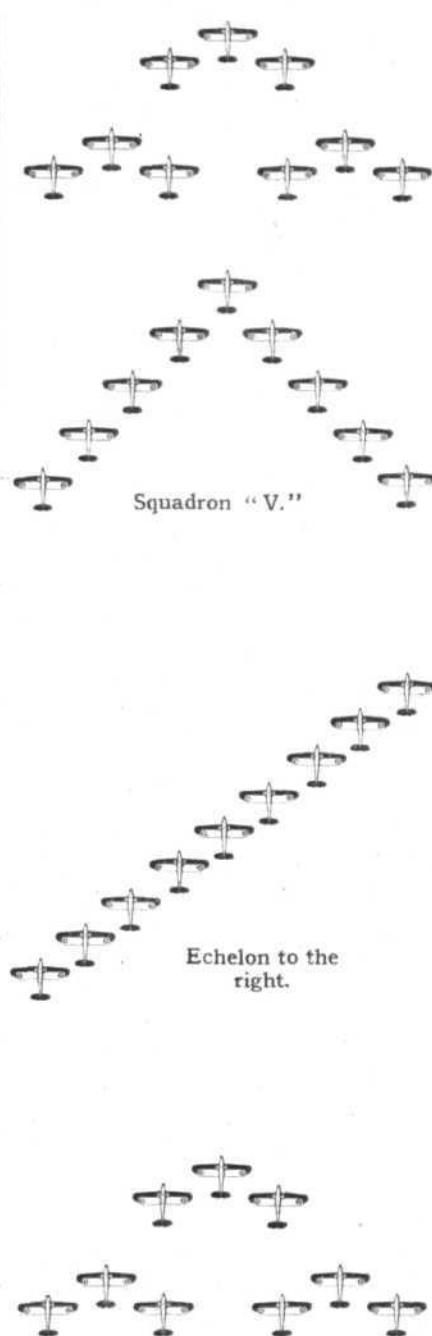
Diagrams illustrating manœuvres in the flight and individual aerobatics events. Reading from the left they are: the upward roll; changing from line astern to flight formation during a loop (both by three machines); and the figure-of-eight loop by a single Hawker "Fury." In this last event the machine half-rolls off the top of the first loop.

AIR DRILL BY THREE LIGHT BOMBER SQUADRONS

NO. 15 (B.) SQUADRON.



NO. 18 (B.) SQUADRON



NO. 57 (B.) SQUADRON



A diagrammatic representation of the manœuvres of Nos. 15, 18 and 57 (Bomber) Squadrons. These units crossed the aerodrome at forty-second intervals, changing formation on each circuit. The top and bottom rows of diagrams show "Squadron formation," the first and last formation assumed by each unit.

the units of Air Defence of Great Britain. Air raids were expected, and two flights, one of No. 1 (Fighter) Squadron in "Furies" and one of No. 23 (Fighter) Squadron in "Demons" were on duty on the aerodrome, waiting for orders. Wireless conversations took place between H.Q. and the fighters, and presently a maroon announced the approach of the raiders (a flight of No. 501 City of Bristol Bomber Squadron) and gave the signal for the "Demons" to take off. They were up very promptly and engaged the "Wallaces." The "Furies" followed, attacking from above while the "Demons" used their rear guns from below. One "Demon" and one "Wallace" were shot down, and the fight passed on.

Which is the more interesting to the Hendon crowds, the bewildering and apparent disorder of aerial combats and converging attacks, or the ordered movement of drilling squadrons? Whatever the answer, the air drill by Nos. 15, 18 and 57 (Bomber) Squadrons was quite a popular item, although the formations were sometimes not quite up to Hendon standard.

The diagrams on this page explain the event. The three

squadrons took off at forty-second intervals and crossed the aerodrome in squadron formation, assuming the various patterns illustrated before crossing the north-western boundary of the aerodrome.

One felt that the squadrons allowed themselves barely enough time to change formation, with the result that there was a fair amount of straggling. In the main, however, the station-keeping was creditable. A speed of about 120 m.p.h. was maintained throughout the manœuvres, at the termination of which each unit dived past in squadron formation at about 180 m.p.h.

"Air skittles," which has a flavour of both the sporting and the spectacular, always goes down well, bringing even the most blasé car-loungers on to their roof-tops. Nine giant skittles provided targets for four Vickers "Virginiyas" of No. 9 (B.) Squadron.

The "Jinneys" made low-altitude circuits in the dear-old-lady manner of their kind, each one depositing a brace of practice bombs as it passed over the target.

14929

The bombs made quite impressive explosions, sufficient to bowl over the skittles by concussion if occurring reasonably near them. One or two almost direct hits were scored, but the last remaining skittle of the nine defied two salvos, eventually capitulating in a most mysterious manner to a bomb which exploded much farther away than its predecessors, thus arousing in many minds a quite unfounded suspicion as to the genuineness of the whole performance.

A low flying attack is the modern, or, more correctly, the most recent, form of the converging bombing attack. The latter used to be the most hair-raising item of the programme, especially when it was brought to its ultimate pitch of perfection by the Fleet Air Arm, as it was when the late Lt. Cdr. L. C. Sharman led his flight of five Fairey "Flycatchers."

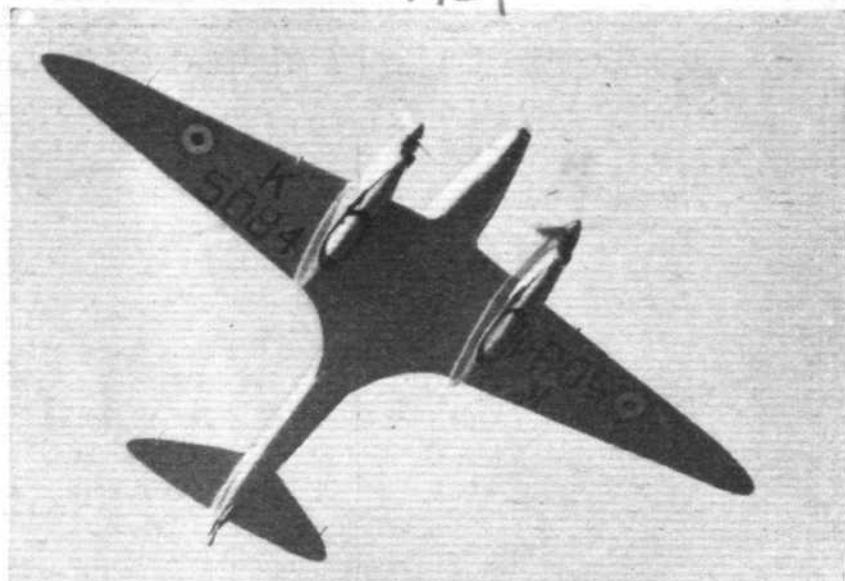
By comparison, the manœuvre on Saturday was, in some respects, a little tame. No bombs were used, only machine guns filled with blank cartridges, and the whole squadron of "Bulldogs" made the attack by flights. That meant that the interval between dives had of necessity to be longer than when one flight makes a continuous attack. First of all, each flight made a dive in vee formation; then one flight alone made a species of converging attack; then all three flights in line astern dove on the target, two flights from one side and the other from the opposite side, but between them. For its purpose, no doubt, this is a more efficient method than the old one. Although this event can be counted as one of the few exciting ones—the snarl of the "Jupiters" and the scream of wires were the most dramatic noises of the day—pilots rather gave the appearance of trying to do the best they could in the face of restrictions which came near to spoiling the show.

No. 26 (Army Co-operation) Squadron, flying the "Audax," gave the usual demonstration of dropping containers by parachute, and afterwards picking up messages. The judgment in both cases was good. Afterwards two "Rotas" of the School of Army Co-operation gave a really good exhibition of slow flying.

Out of an almost cloudless sky came three "Furies" of No. 25 (Fighter) Squadron for the next event—flight aerobatics. Despite the bumps, which, in the heat, must have been violent near the ground, they came as one machine in flight formation, rocket looped and turned, the leader half-rolling off a loop and the others making climbing turns and rejoining him immediately.

In echelon the three machines half-rolled off a loop and reformed as a flight in a second loop—a manœuvre which not only called for perfect timing but for a real reserve of power.

Twice the flight rolled as a single machine, first in a half-roll off a loop and then in a full upward roll as a finale. In each the timing and station keeping were excellent, but the most perfect demonstration was given in line abreast forma-



The beautiful lines of the "Comet," which won the MacRobertson Race and now bears Service markings, were the subject of unanimous praise. (Flight photograph.)

tion, in which the three looped and made stalled turns in each direction before re-forming in "vee."

When laymen fall to discussing flying, parachutes are bound to crop up sooner or later in the conversation. So, naturally, the parachute demonstration has "a wide public." This year the event lacked any kind of thrill, for it merely entailed the release from a pair of Home Aircraft Depot "Virginias" of sixteen Irwins with 200lb. weights attached; this method is the one used to test their functioning before issue to Service units.

The announcer explained that the webbing harness has to stand a breaking strain of 3,500lb., and that the silk must be strong enough to withstand the shock of 211lb. travelling at 400 m.p.h. Obviously, there was considerable disappointment at the omission of live drops.

"Air drill by a single-seater fighter squadron" was the official title of Event No. 7. To the public it meant a demonstration of the different formations used by a whole squadron of our latest single-seater fighters—the Gloster "Gauntlet" (Bristol "Mercury VI").

Actually, the event gave us some of the best formation flying of the day. The changes were extremely cleanly and smartly made, and the formations even. The attempt at broadcasting the leader's commands by radio telephony was not so good, although at times the uninitiated could certainly understand the gist of them.

Fighter Squadron Drill

Formation flying by a whole squadron of fighters—No. 19 Squadron in this case—somehow seems unexpected. One rather looks to light bombers for that type of business and expects the work of fighters to be mostly in flights; but this event showed that they are equally at home in large formations as in small.

Next, No. 605 (County of Warwick) (B.) Squadron took off and acted as enemy raiders on London. A post of No. 1 Group Centre, Observer Corps, sent in early news of the approach of the raiders. The anti-aircraft guns of the 26th Air Defence Brigade of the Territorial Army thereupon engaged the enemy with blank, firing from stations on the aerodrome. Two of the bombers were shot down, emitting white smoke to simulate fire. The raid proceeded on its way, and fighters would doubtless meet it later on.

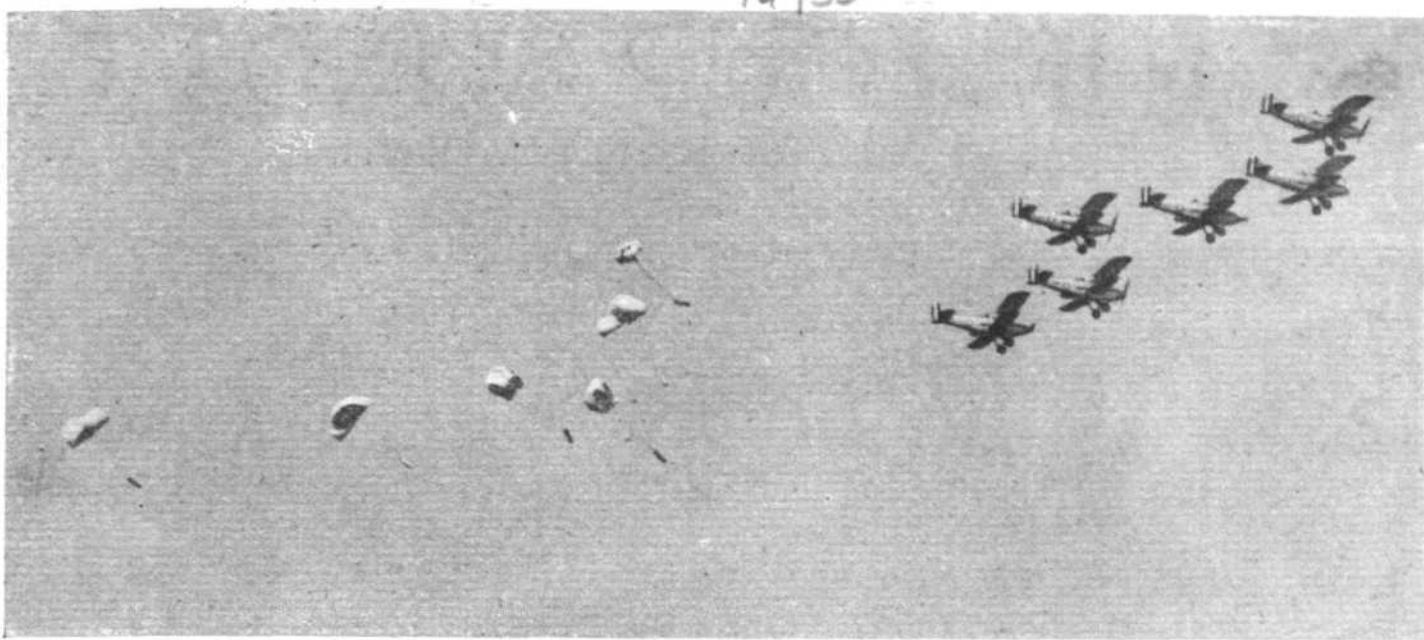
The inclusion in the R.A.F. Display programme of items representative of the work of the sea-going sections of the service is no easy matter. Sea reconnaissance, to be appreciated, should be watched in its natural environment. For all that the formation of flying boats commanded by Wing Commander G. E. Livock, D.F.C., A.F.C. (C.O. of No. 209 Flying Boat Squadron, which is at present stationed at Felixstowe), provided an impressive spectacle as it flew across the aerodrome, with the Short "Sarafand" in the lead, the Short "Singapore III," Vickers-Supermarine "Stranraer" and "Scapa," and Saro "London" on each side, and the Short "R.24/31" (nicknamed "The Knuckleduster") bringing up the rear.

The little Saro "Cloud" landed on the aerodrome to show



Juvenile, but nevertheless critical, interest was not lacking. The picking-up of messages by the six "Audaxes" of No. 26 (A.C.) Squadron certainly met with approval. (Flight photograph.)

14930



Hawker "Audaxes" of No. 26 (A.C.) Squadron deliver the goods. Provisions are dropped in special parachute-equipped containers from the bomb racks. (Flight photograph.)

its amphibious tendencies and then joined the formation again. After circling the aerodrome quite low down and giving the crowds a good view, the flying boats formed up in line astern and made another circuit. Exactly why it should be so is difficult to explain, but there was about the boats an air of purposeful inevitability; one felt as if nothing in the world could fluster them.

No one has yet produced an eraser for faults made while writing or drawing with smoke in the sky, so the artists who adopt this medium require a bold and certain technique. This the "Bulldog" pilots of No. 3 (F.) Squadron certainly possessed. There were five of them, two using white smoke, two with orange and one with green. As usual, the smoke was quickly dispersed owing to the air currents experienced at the comparatively low heights at which the "Bulldogs" performed their evolutions.

A particularly effective spectacle was that of three machines (two greens, with the orange in the centre) flying straight, making three parallel lines, while the "whites" plaited their smoke trails among these colours. Another striking pattern was formed by all five machines looping individually from an extended line astern formation. There were, in addition, the usual manœuvres, including the "Prince of Wales' Feathers," all executed in a masterly manner. The smoke-producing apparatus, as at previous Displays, was supplied by Major J. C. Savage, of "sky-writing" fame.

While the "Bulldogs" "wrote and, having writ . . ." engines were started in the "New and Experimental" park in readiness for the parade and fly-past. Programmes in the adjacent enclosures did evolutions unsurpassed by anything on the other side of the fences, and the "hush-hushers" began to taxi out, with the Gloster four-gun fighter (Bristol "Mercury") in the lead. The Hawker "P.V.4" dive-bomber (Bristol "Pegasus" III or X—there seemed to be some contradiction on this point) followed. Then came the H.P.47 G.P. monoplane (Bristol "Pegasus") and another G.P. machine, the Vickers biplane (Bristol "Pegasus"). The Avro 652, a Coastal Reconnaissance monoplane (two Siddeley "Cheetahs"), and the new Armstrong Whitworth A.W.23 Troop Carrier (two Siddeley "Tiger VI") afforded an interesting comparison in size, both being twin-engined low-wing monoplanes with retractable undercarriages. The Vickers-Supermarine "Seagull V" (Bristol "Pegasus"), although an amphibian flying boat, looked quite diminutive following close behind the A.W.23. The machines flew around in the same order, but the nature of the whole event was such that one

could form no real opinion of the capabilities of the different types.

Some of the newer types, unfortunately, remained in the park, such as the very pretty Bristol Troop Carrier (two "Pegasus") and the Vickers General Purpose monoplane (Bristol "Pegasus"), while for some reason the Westland "Pterodactyl V" two-seater fighter (Rolls-Royce "Goshawk") was not flown. The De Havilland "Queen Bee," otherwise the radio-controlled "Tiger Moth," also remained on the ground.

Once again the Central Flying School instructors, with three Avro "Tutors" equipped and clearly marked for inverted flying, exhibited their indifference to the personal circulatory problems, and their capacity to do everything but land in the inverted position. It was a most polished show.

In past years the final item of the Display has, as everybody knows, been a "set-piece" in which a fort, munition works, aerodrome, ship or other objective belonging to a nefarious enemy has gone up in flames, smoke and terrific noise, to the general delight. This time, for some reason best known to the organisers, the *finale* took the form of a fly-past by nine squadrons of machines which had taken part in the display.

It must be admitted that the item was unimpressive, either by comparison with the *finales* of previous years or with several items the same afternoon. The squadrons—in "Vic" formation—were too far apart to be considered as a whole, and too high, and there was little spectacle or interest to hold the attention of crowds who had been watching the passing of formations of various kinds for the previous four or five hours.

However, it did one good thing in that many people left early and thus eased off the homeward rush.

And thus ended the Sixteenth Royal Air Force Display.

11665



Too much realism. The unfortunate accident to the "pupil's" "Tutor" in the Instructional Flying event caught by the camera; the machine has not yet come to rest. (Flight photograph.)

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS



MORE THAN MEETS THE EYE: This innocent-looking D.H. "Tiger Moth" is actually the wireless-controlled target machine, designated the "Queen Bee," the existence of which was kept an official "secret" until a few days ago. Note the connection at the side of the fuselage for catapult work. Some details will be found on page 18d.

Mr. Churchill Advises

Mr. Winston Churchill has consented to advise on that section of Alexander Korda's new film, *The Conquest of the Air*, which deals with British achievements in the air.

Strife at Heston

A demonstration of protection against aerial and chemical warfare, which will entail the "bombing" and blowing up of a motor car, rescues from a burning aeroplane, and treatment of the victims of a "gas attack," will be given by the Legion of Frontiersmen in collaboration with the St. John Ambulance Brigade at Heston on July 10.

Sky Squatters

The brothers Fred and Alfred Keys in a high-wing monoplane, which, although reported to be of their own design, bears a remarkable resemblance to a Curtiss "Robin," have beaten the world's endurance record (with refuelling) of 23 days 1 hr. 41 min. 30 sec. So far as can be gathered they are still in the air at the time of writing.

A Wide Speed Range

Mr. Eric W. Walford, the well-known Coventry pioneer motorist, travelling to a week-end rally of the Institution of Automobile Engineers at Burford, flew from Coventry to Witney—the nearest aerodrome to Burford—in his private "Moth," and continued the journey to the rally in a friend's 6 h.p. Daimler of 1899 vintage. The forty-one mile trip between Coventry and Witney took twenty-five minutes, and the Daimler covered the seven-mile Witney-Burford stretch in ten minutes over the hour.

Marksman

Two cruisers recently deserted the Canton Government and tried to join the forces of the Nanking Government. While passing out of the mouth of the Canton River they were fired on by forts, and an officer of one of the ships stated that they were attacked by 100 aeroplanes, which dropped over 1,000 bombs without hitting either ship.

"Platoon—Eyes Up!"

Sir Philip Sassoon, Under Secretary for Air, was expected at King Edward's School, Whitley, and a guard of honour from the cadet corps was drawn up to wait for him at the school entrance. But instead of the expected car an aeroplane appeared, circled twice, and landed at the private aerodrome of Sir John Leigh, M.P., near the school. Sir Philip had arrived.

Twenty-five Years Ago

From Flight of July 1, 1910

"Would it be possible to make use of the exhaust from petrol engines used on biplanes and other aeroplanes of this class to drive an extra propeller, or in some other way? I suppose a steam turbine, as they are now constructed, would be useless on account of the heat. I have an idea that a very light engine, combined with a specially constructed turbine would work well, also be made at a reasonable cost." (From a reader's letter.)

In Honourable Retirement

A Tri-motor Ford which went into service in 1927, and is said to have been the first commercial aircraft to cross the Rocky Mountains, has found a last resting-place in the Ford museum at Dearborn, Michigan.

Just an Echo

The explosion of about 100 tons of ammonium in North Ural mine shafts has aroused great interest among Soviet scientists, since the sounds of such explosions may make possible the determination of the height of the stratosphere layer which echoes them.

Pea-soup Protection

"Surely thickly diffused fog and smoke generators in the charge of voluntary organisations could, with half an hour's warning, make and maintain an effective smoke shroud over London or any other vulnerable district. In fact, the countless chimney pots of our cities could provide an artillery that no aircraft could face or overcome."—Suggestion in a letter to *The Times*.

Strangular

When F/O. E. D. McK. Nelson was flying a seaplane engaged in towing a sleeve target over Portland Harbour last week his scarf caught in the towing wire and threatened to strangle him. He was pulled from his seat, but the airman in the rear cockpit managed to cut the scarf, allowing him to drop back, and, after considerable shaking on the part of the airman, to regain control of the machine.

NEXT SATURDAY'S ROYAL REVIEW

Over 350 Royal Air Force Machines to Fly Past the King : A Guide to the Proceedings at Mildenhall and Duxford

OVER three hundred and fifty aircraft from thirty-eight squadrons will, as already reported in *Flight*, be reviewed by His Majesty the King, accompanied by Her Majesty the Queen, at Mildenhall, Suffolk, and Duxford, Cambridgeshire, next Saturday.

A rehearsal is due to take place to-day, July 4, or, if to-day's weather is unfavourable, to-morrow.

The time table of the actual Review is as follows:—The King is due to leave Newmarket at about 10.50 a.m. and will drive along the Newmarket-Mildenhall road—a distance of approximately ten miles—reaching Mildenhall Aerodrome at 11.20 a.m. It is here that he will review the whole 350 machines, with their personnel, on the ground.

On completion of the tour of inspection along the lines of aircraft, Their Majesties will leave for Duxford at 12.15 p.m., arriving there for lunch in the officers' mess at 1.5 p.m. They will be accompanied by the Prince of Wales and the Duke of York.

The Royal procession to the dais in the Royal enclosure on Duxford Aerodrome will begin at 2.15 p.m., the Royal cars passing slowly in front of the public enclosures on the North side of the Aerodrome. Their Majesties will mount the dais at 2.25 p.m. and the flying part of the Review will begin at 2.30 p.m.

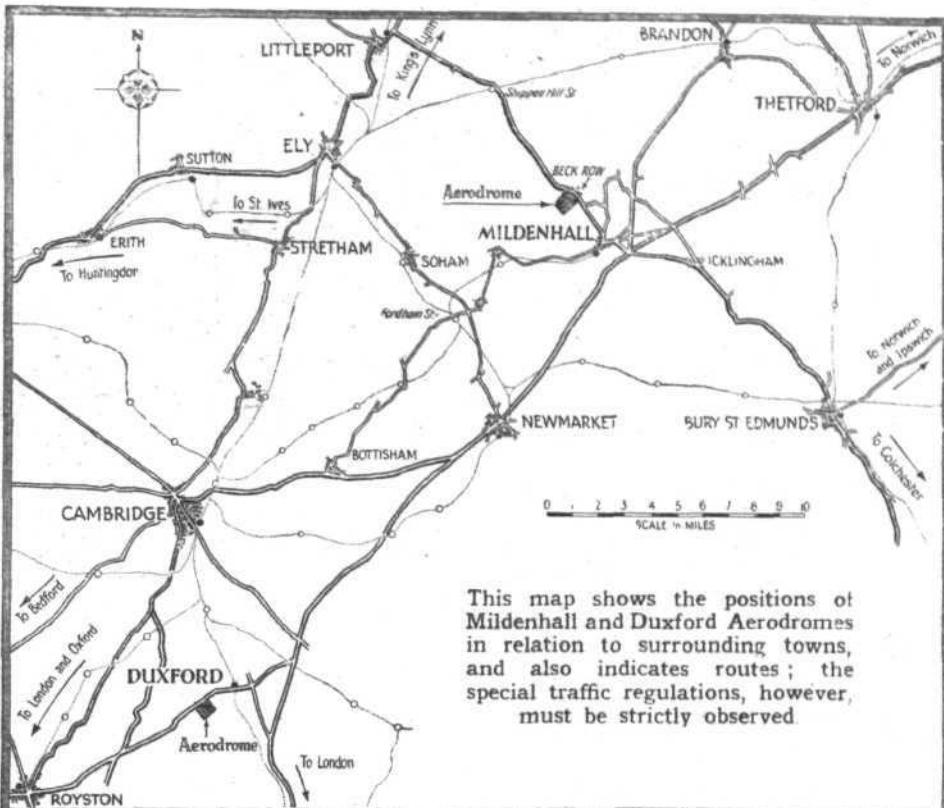
The units taking part in the Review as a whole (i.e., both sections) will be as follows:—

Fighter Squadrons.—Nos. 19 ("Gauntlet"), 1, 43, 25 ("Fury"), 23 ("Demon"), 56, 54, 32, 111, 3, 17 ("Bulldog"). *Light Bomber Squadrons.*—Nos. 12, 142, 15, 18, 57 ("Hart"), 35 ("Gordon"). *Medium Bomber Squadron.*—No. 101 ("Overstrand"). *Heavy Bomber Squadrons.*—Nos. 10, 99 ("Heyford"), 7, 58, 9 ("Virginia"). *Coast Defence Unit* (Gosport).—Various types. *Army Co-operation Squadrons.*—Nos. 2, 26 ("Audax"). *Special Reserve Squadrons.*—Nos. 501, 504 ("Wallace"), 503 ("Hinaidi"), 500 ("Virginia"). *Auxiliary Fighter Squadrons.*—Nos. 600, 601, 604 ("Hart"). *Auxiliary Light Bomber Squadrons.*—Nos. 602, 603, 605 ("Hart"), 607, 608 ("Wapiti").

Certain of the above units will not take part in the fly-past, being confined to the Mildenhall inspection only. These are as follows:—

Squadrons Nos. 35, 101, 7, 58, 9, 501, 504, 503, 500, 600, 601, 604, 602, 603, 605, 607, 608, and Coast Defence Unit.

The twenty squadrons taking part in the fly-past will pass over in succession; one squadron will then give an exhibition of air drill, and seventeen of the Squadrons will re-form and



This map shows the positions of Mildenhall and Duxford Aerodromes in relation to surrounding towns, and also indicates routes; the special traffic regulations, however, must be strictly observed.

fly over in wings. During this period the King will take the salute. This part of the programme will terminate at 3 p.m., and the Royal party will leave shortly afterwards by car for London.

It is expected that the public will attend in very large numbers, and free enclosures are being provided to accommodate 100,000 spectators at Duxford, and 25,000 at Mildenhall. Extensive car parks are being provided by the Royal Automobile Club, and National Car Parks, Ltd. The parks at Duxford will hold 30,000 cars, and at Mildenhall over 10,000. From certain of these parks a good view will be obtainable, and one R.A.F. park at Duxford, with accommodation for 3,000 cars, is on the aerodrome itself.

A small charge to cover expenses will be made for admission to these parks. Cars will be charged at 2s. 6d. each, and motor cycles at 1s.

In order to handle the large volume of traffic on the surrounding roads special arrangements have been made, and drivers must follow police directions explicitly. As certain roads in the neighbourhood of each aerodrome will be closed, spectators are strongly advised to arrive early; Mildenhall motorists should be in their places by 10 a.m., and those at Duxford by 1.30 p.m.

Motorists are earnestly requested to apply immediately for car park reservations and route labels to the following:—For R.A.F. controlled parks—the Secretary, Royal Automobile Club, Pall Mall, London, S.W.1; for National Car Parks—National Car Parks, Ltd., 53a, Shaftesbury Avenue, London, W.1, The Automobile Association, Fanum House, New Coventry Street, London, W.1, or any A.A. Provincial office.

NEW HAWKER DIRECTORS

AT the Annual General Meeting of Hawker Aircraft, Ltd., on June 25, the appointment of five new directors was announced. These were Flt. Lt. P. W. S. Bulman, M.C., A.F.C., Mr. Sydney Camm, Mr. Herbert Chandler, Mr. H. K. Jones, and Mr. R. W. Sutton.

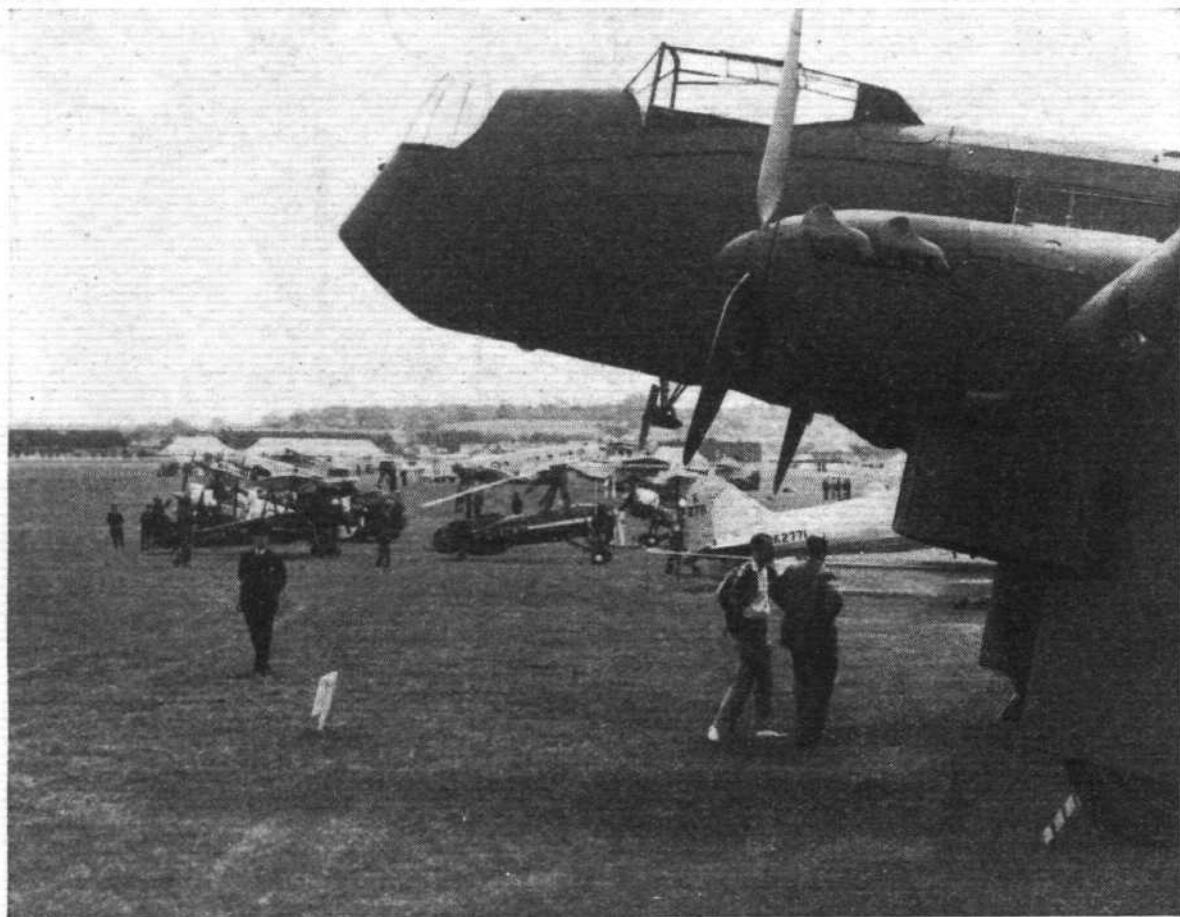
"George" Bulman, as everyone calls him, was a test pilot at the R.A.E. before he joined the firm, and apart from his qualities as a pilot he is an acknowledged expert on engines. The success of Hawker machines is due in no small measure to Mr. Bulman's abilities. Mr. Camm's connection with aviation goes back to the earliest days, he having been on the design staff of Martinsyde's long before the War. As chief designer Mr. Camm has borne the technical responsibility

for Hawker machines for several years, with what success the world knows. Mr. H. Chandler is secretary of the firm, a post which he has held for a number of years with distinction.

Mr. H. K. Jones looks after many of the Hawker activities, and is known by everyone in aviation circles abroad no less than at home. The firm's foreign business has been in his hands for many years, and there is scarcely a country in Europe in which he is not a familiar figure among flying people. Mr. R. W. Sutton has, so to speak, been with the "family" always. He was a member of the original Sopwith firm, and later of the H. G. Hawker Engineering Co., Ltd. His particular business lies in the province of Air Ministry contracts.

THE S.B.A.C. ENTERTAINS

Some 1,200 Guests, Representing Forty-seven Different Countries, Witness
Hendon Trade Display



At Hendon last Monday. A general view of some of the aeroplanes on view, with the nose of the Fairey "Hendon" in the foreground. (Flight photograph.)

THAT the British Aircraft industry was following the old British tradition that there is nothing gained by creating a sale for an article which does not give complete satisfaction after sale was pointed out by Sir Robert McLean, chairman of the S.B.A.C., in a speech of welcome to the guests, numbering some 1,200, at the official luncheon at Hendon last Monday.

The occasion was, of course, the Display and Exhibition organised by the Society of British Aircraft Constructors for the benefit of a large number of invited guests, mostly from overseas.

A Happy Compromise

Sir Robert McLean also mentioned that these visitors represented no fewer than forty-seven different countries, and recalled that this was the fourth in the series of displays to be organised by the Society. These displays, he said, had become very popular, and it was difficult to fit in in the time available flying demonstrations of all the aircraft which the British industry had to offer. He particularly stressed the British policy of providing a happy compromise between speed and low operating costs. In the "static" exhibition the visitors would find much to interest them, and he would especially recommend the engines in the exhibition to their attention.

Sir Philip Cunliffe-Lister, the new Air Minister, after expressing his pleasure at the opportunity to welcome so many foreign friends, said his friend Dr. Addison, who was something of an expert on extravagant expenditure, had told him that in connection with the expansion of the R.A.F. vast new legislation would be necessary. That he

did not believe, and he foresaw a real partnership between the Air Ministry and the industry in which no special legislation would be needed. He thanked Lord Weir for re-associating himself with the Air Ministry in connection with the expansion.



The cockpits of the Westland "Wallace" are protected by folding transparent hoods. (Flight photograph.)

11697⁵

Water-cooled representatives : The Fairey "Hendon" heavy bomber on the left has Rolls-Royce "Kestrel" engines, while the "Fantome" on the right has the Hispano-Suiza *moteur canon*. (Flight photograph.)

The morning of Monday last, from 10.30 a.m. to 1 p.m., was devoted to flying demonstrations of the different aeroplanes. Each firm was permitted eight minutes in which to show its machines, and many of the constructors elected to demonstrate one machine only, keeping several other types on the ground for inspection. A report of the "static" section of the display will be found on pages 21-30 of this issue.

The first event, which took place with R.A.F. promptitude exactly at 10.30 as given in the programme, was a demonstration of the Westland "Wallace" general-purpose biplane (Bristol "Pegasus"). The "Wallace" is already well known as being one of the machines by means of which the first flights over Mount Everest were made. The model shown has a "conservatory" over the rear cockpit in order to screen the gunner thoroughly from the slip-stream.

Protection for the Crew

It is, of course, difficult to demonstrate a general-purpose machine effectively, but we were shown its capability of making fast climbs, of diving, and also of flying slowly. The "conservatory," which covers both cockpits, may be opened either by the pilot or by the gunner at any speed.

The "Wallace" can be arranged for Army Co-operation work, photographic purposes or as a seaplane, while with long-range tanks reconnaissance work over great ranges may be undertaken. The landing demonstrated the effectiveness of the Handley Page slots, as it was very slow and gentle.

Immediately the "Wallace" landed, the new Fairey "Fantome" multi-gun fighter, built for the competition now being held by the Belgian Government, took off. The take-off was spectacular and started with an upward roll almost straight off the ground. One of the requirements of machines entered for the competition is a top speed of at least 250 m.p.h., and there was little doubt from the demonstration that the "Fantome" exceeds this by a wide margin. Its manoeuvrability was demonstrated, in the way which Flt. Lt. Staniland had made all his own, by constant rolls; in fact, hardly for

a moment did he maintain the machine on a straight and level keel.

The climb of all modern fighters is, of course, extraordinary, as is their capability for being dived vertically with the engine "full on." The "Fantome" could apparently fly vertically, or so it seemed, for several thousand feet.

Perhaps almost as surprising as the high speed manoeuvrability was the extremely slow flight with which the demonstration ended, the machine being brought across the aerodrome without loss of height at what looked like a great deal less than 60 m.p.h. Flt. Lt. Staniland must be able to stand as many "G's" as anyone, as his turns at low altitude inside the aerodrome were as tight as we have seen for a very long time.

Two Contrasting Types

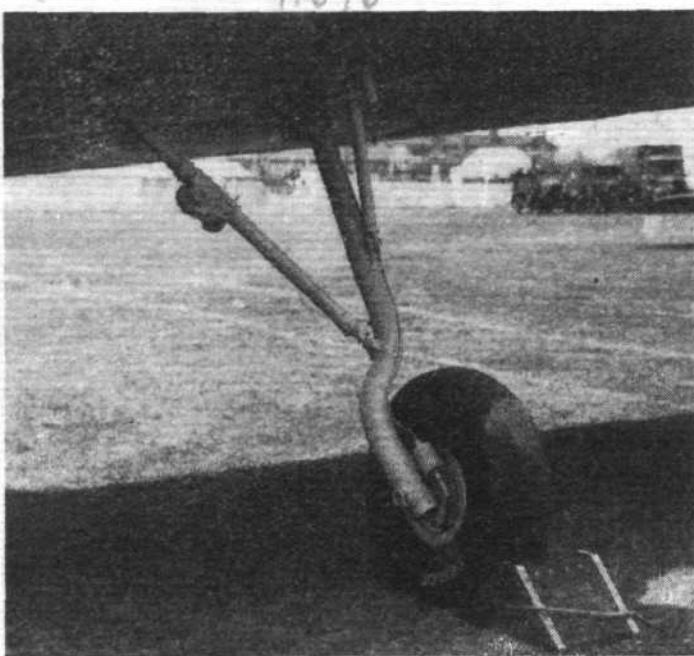
The next demonstration was that of the Vickers' G.4/31 general-purpose torpedo bomber biplane and the Vickers' P.V. bomber monoplane; the former is very reminiscent of the Vickers "Vespa," while the latter is a low-wing monoplane with a retractable undercarriage, which, however, was not yet in retractable condition. The Bristol "Pegasus" engines of both machines were completely cowled with Townend ring form of cowlings. Despite its span the monoplane was shown to be extremely manoeuvrable and was thrown about in no uncertain manner. With the trailing edge flaps down—these did not extend underneath the fuselage but only outwards from the wing roots for about two-thirds of the span each side—the monoplane was brought across the aerodrome at an uncannily slow speed.

The Vickers' pair made their landings beside each other, and it was difficult to see which was the slowest. Presumably, they were both flown "light."

The next demonstration was the Avro 652A Coastal Reconnaissance monoplane. This is a military version of the Avro 652 described in *Flight* of March 7, 1935. Large numbers of these machines have been ordered by the Air Ministry. The engines are two Siddeley "Cheetah VI." The rear cockpit, which is situated about half-way along the fuselage, is covered with the "conservatory" which has now become almost

11702⁵

The Vickers monoplane bomber (Bristol "Pegasus") has a special type of construction in which curved diagonal members play an important part. (Flight photograph.)



The retractable undercarriage of the Vickers monoplane was not completed in time to show it in its finished state. (Flight photograph.)

standard on aircraft of the reconnaissance and bomber type.

There is little that the pilot can do in a demonstration of the larger types of military aircraft except to show off their high- and low-speed characteristics and general manoeuvrability, but this latter feature is always, of course, overshadowed by the aerobatic displays of the high-speed fighting aircraft. A monoplane like this 652A, particularly one with twin engines, is not meant to be thrown about in a spectacular manner, and for this reason the resulting demonstration is, unless one knows the weight to which the machine is loaded, apt to lose its value from the public point of view. As we said in our article describing the civil version, the 652, this monoplane is excellent in every respect that a pilot can wish.

The Bristol Company demonstrated two of their well-known single-seater fighters, the "Bulldog" Mk. IV and the "Bullpup," the former with a "Mercury" driving a V.P. airscrew, and the latter with an "Aquila" engine. Their display was well arranged as, although they were both in the air at the same time, they did not do their manoeuvres in front of the audience at the same time, one following after the other.

From the point of view of manoeuvrability, dive, and climb, there did not seem to be a great deal of difference between the two. It was noticeable, however, that the "Aquila" was a much quieter engine and lacked that noise on the dive which sounds like a gargantuan machine gun. This may have been because the cowling in this case was practically what is known as the complete or N.A.C.A. type.

First Public Demonstration

The "Aquila" is, of course, the smaller of the new sleeve-valve Bristol engines, and this was its first public demonstration. The demonstration of both machines was largely confined to a series of dives to the aerodrome, with a roll during the subsequent steep climb. The "Bullpup," in particular, was noticeable for its ability to continue climbing after the roll was completed.

The Supermarine "Seagull V" amphibian flying boat, which can be catapulted from ship decks, has already been in use in the Fleet Air Arm for some time. Its most important features were described in *Flight* of March 29, 1934. As it is a biplane its span is comparatively short, and this, no doubt, assists in making it manoeuvrable, which it undoubtedly is. Some of the turns during the flying demonstration were of extremely small radius, and the pilot "threw it about" in a manner more reminiscent of a land machine than a flying boat.

It is primarily intended for naval reconnaissance or fleet spotting operations from H.M. ships, and is being used in considerable numbers by the Australian Government for coastal reconnaissance purposes. The demonstration finished with two very tight loops at low altitude as final conclusive proof that a flying boat, properly designed, can compete with land machines in manoeuvrability.

The British Aircraft Manufacturing Co. was the first to demonstrate purely civil machines. The first of its two examples was the B.A. "Eagle" (see *Flight*, November 9,

1933), a low-wing cabin monoplane with retractable undercarriage and "Gipsy Major" engine.

After the high-power military types which had been previously demonstrated, the engine hardly appeared to be making any noise at all. Flt. Lt. Wilson, who was flying the "Eagle," started his demonstration by a very slow flight across the front of the enclosure, during which he raised and lowered the undercarriage twice, showing thereby how quickly this operation can be carried out. Flt. Lt. Wilson having landed, Mr. Bey then took off in the B.A. "Swallow" (*Flight*, March 1, 1934). This was the lowest-powered and lightest machine in the display, and, apart from the Autogiro, it was probably able to fly more slowly across the aerodrome than any other machine. It has a high top speed for a machine which can fly so slowly, but it was the latter characteristic which formed the more outstanding part of the demonstration. The Pobjoy "Cataract" engine was extremely quiet, and altogether the "Swallow" looked what it is—an admirable open two-seater for private use.

A Very Short Run

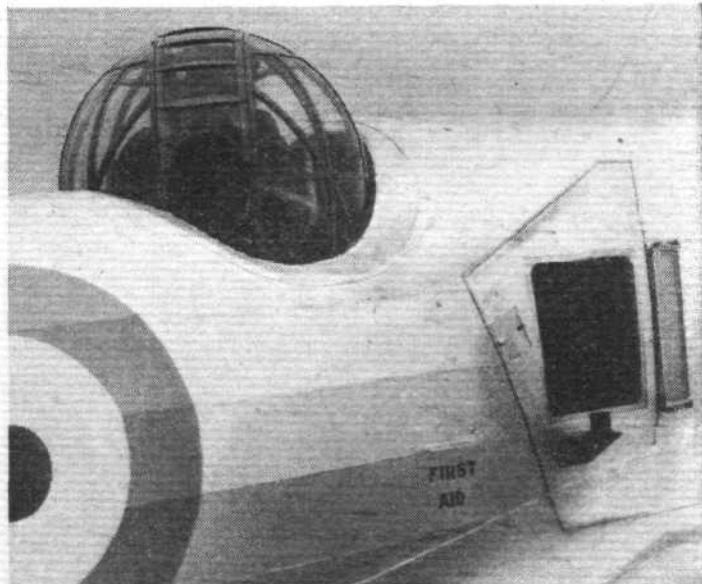
Very much be-slotted and flapped, the Handley Page H.P.47 (*Flight*, April 18, 1935) general purpose monoplane took off for its demonstration with a very short run. By virtue of its very small-sectioned rear fuselage it is an unusual looking machine and created considerable interest. Any doubts which spectators may have had about the strength of this fuselage and tail were quickly dispelled by the way in which the machine was thrown about.

Here, again, the most impressive part of the display was its slow flight, this being a point of particular interest in view of the slots and flaps for which its constructor is so well known. Capt. Cordes even scorned to fly up-wind in the usual manner, so confident was he that the slowness of its flight could demonstrate itself.

The Short "Scion" (*Flight*, February 28, 1935) flown at the display (and now being built by Pobjoy Airmotors and Aircraft, Ltd.), is one of the machines regularly used by Southend Flying Services on their ferry services across the mouth of the Thames. The first part of the demonstration showed the ability of this machine to fly on one engine, a very desirable and, one might almost say, absolutely necessary feature for a twin-engined machine intended for civil purposes.

As the machine is a cabin monoplane with accommodation for five passengers, we naturally did not expect to see it thrown about in a spectacular manner, but both the high and low ends of its speed range were shown effectively, as well as its ample degree of manoeuvrability. Machines of this type, which are to all intents and purposes immune from forced landings in any circumstances, are already finding a market in many parts of the world among people other than airline operators. For example, H. Hemming and Partners are using one for a photographic survey of goldfields in New Guinea.

The Saunders-Roe "Cloud" amphibian has been well known to readers of *Flight* for a number of years. The model demonstrated had two Napier "Rapier" engines, giving it a speed of 124 m.p.h. The "Cloud" is at present being used by



"The Coliseum": The transparent turret over the gunner's cockpit in the Avro 652 A would look quite at home at the lower end of St. Martin's Lane. (Flight photograph.)



Metal skin construction is used in the Bristol Bomber Transport (two Bristol "Pegasus" engines). (Flight photograph.)

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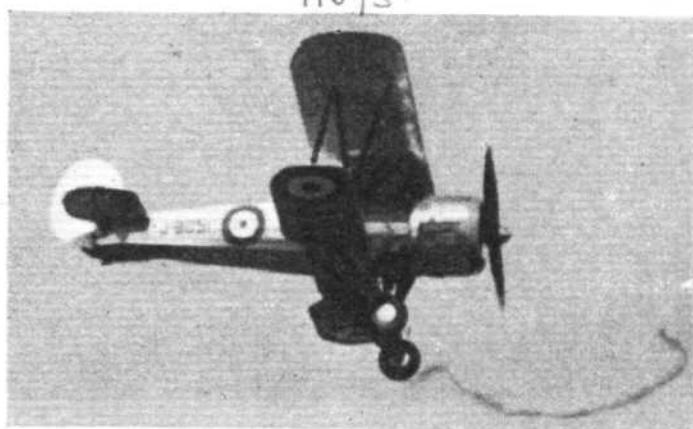
the Royal Air Force for navigational instruction flying. One could not help wondering whether there was any benefit to be obtained by the makers from flying a machine of this nature on such an occasion unless he can carry passengers. The pilot can, practically speaking, do nothing except fly round and round, and one can only hope that those many potential purchasers who were present were sufficiently interested to follow up the matter and see for themselves, by personal trial, how well the machine behaves on water as on land.

The Parnall "Heck" (Flight, February 21, 1935), "Parnall" since Mr. Basil Henderson of the Hendy Aircraft Co. joined forces with Parnall Aircraft, Ltd.—is the machine which was specially built by Mr. B. B. Henderson for Mr. Whitney Straight, and its very high performance was very ably demonstrated. On the ground its very high finish was particularly noticeable, and it seemed probable that this, especially on the wing, would add to the performance to a large extent.

The demonstration differed somewhat from the others in that the pilot started off by almost disappearing out of sight on the far side of the aerodrome. His return at low altitude at full speed down-wind, straight across the aerodrome, with his undercarriage retracted, was undoubtedly a fine opening to a demonstration of a machine of which the high cruising speed is the chief selling point.

This characteristic, however, was not allowed to overshadow its slow flying and slow landing capabilities, as at a later stage the effectiveness of the Handley Page slots and slotted flaps was shown by a series of astonishingly slow flights.

The Airspeed "Envoy" (Flight, July 12, 1934) and "Courier," the twin- and single-engined Airspeed commercial monoplanes, were both in the air together, first one and then the other diving at the enclosure and presenting an excellent view of their graceful and very sharply tapered wings. Both types have retractable undercarriages with the wheels protruding slightly in a position which allows them to revolve, so that a forced landing on soft ground could be made with the undercarriage up to avoid any possibility of the machine nosing over. Both types are widely used in many countries of the



The Bristol "Aquila" engine was seen at Hendon for the first time in this Bristol "Bullpup." (Flight photograph.)

world, particularly on airlines where a high cruising speed is vitally necessary. The "Envoy" is fitted with two Siddeley "Lynx" IV C. engines, and the "Courier" has a Siddeley "Cheetah V."

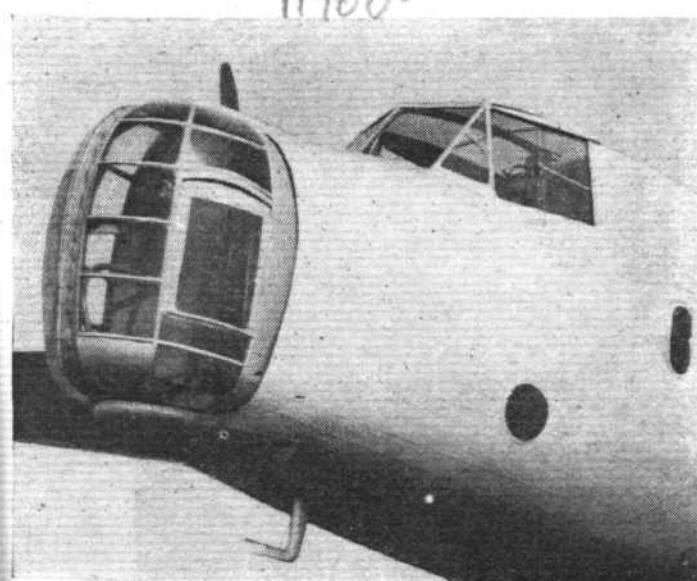
The Blackburn "Shark" (Flight, December 13, 1934) with the somewhat terrifying designation of "Torpedo-Spotter-Reconnaissance-Biplane," was demonstrated with a torpedo in position underneath the fuselage between the undercarriage legs. With its Siddeley "Tiger" engine opened wide, it was brought across the front of the enclosure in a very impressive manner, and, despite the load it was carrying, climbed afterwards steeply and to a good height. The "Shark" also has Handley Page slots and, while flying so slowly that these were wide open, the pilot showed off the high degree of lateral control and the effectiveness of his ailerons.

As we have now come to expect, Flt. Lt. L. K. Turner-Hughes demonstrated the Armstrong-Whitworth "Scimitar" in a most spectacular manner. His first zoom appeared to carry him as high as anything else that was demonstrated, while the rapidity of change over from one turn to another was astounding. Most noticeable was the acceleration displayed when the engine was opened up after a slow flight across the front of the enclosure.

Fast or slow, his rolls were beautifully made about a practically horizontal axis. At times he made climbs which were almost vertical. A full roll while climbing nearly vertically and then a half roll to normal flying position at the top is certainly an effective method of demonstrating the reserve of power.

General Aircraft, Ltd., demonstrated their S.T.25 "Jubilee" model monoplane, which was dealt with very fully in Flight of June 27, 1935. As with the other civil machines of a somewhat similar type, the demonstration was confined to showing its ability to fly on one engine, fast and slow straight flying, and a general demonstration of the effectiveness of its controls. It is a pity, perhaps, that some method of completely stopping the airscrews was not available, as then the pilot would have been able to show how easily the Pobjoy engines can be restarted by means of the hand-operated starter.

The take-off of the Gloster F.7/30 single seater fighter was extraordinary. F/O. P. E. G. Sayer put it into a very steep climb immediately after an amazingly short take-off, and then after a practically vertical climb dived vertically on the aerodrome, during which he did an aileron turn. Flying all the



The gun turret in the nose of the Bristol Bomber Transport. (Flight photograph.)



The Armstrong-Whitworth Bomber Transport (two Siddeley "Tiger VI") has a transparent gun turret at each end of its fuselage. This picture shows the rear turret.
(Flight photograph.)

time beautifully smoothly and apparently in an entirely unhurried manner, he yet carried out his manœuvres at very high speeds which were largely deceptive because of the lack of noise of his Bristol "Mercury" engine.

As the F.7/30 was developed from the "Gauntlet" we naturally expected something spectacular in the way of

manœuvrability, but the amazingly short radius of Mr. Sayer's turns was a revelation of how it is possible to combine manœuvrability with high speed in modern aircraft. The cantilever undercarriage, with Dowty internally sprung wheels, must account to a considerable extent for the increased performance of this type.

Despite the fact that the machine is a low-wing cabin machine for civil use, Capt. E. W. Percival threw his "Gull" (Flight, March 21, 1935) about and looped in quite a spectacular manner, thereby showing that a high degree of controllability is not incompatible with high speed, while at the other end of the range the use of trailing-edge flaps was shown to have brought the slowest flying speed down to a very low figure indeed.

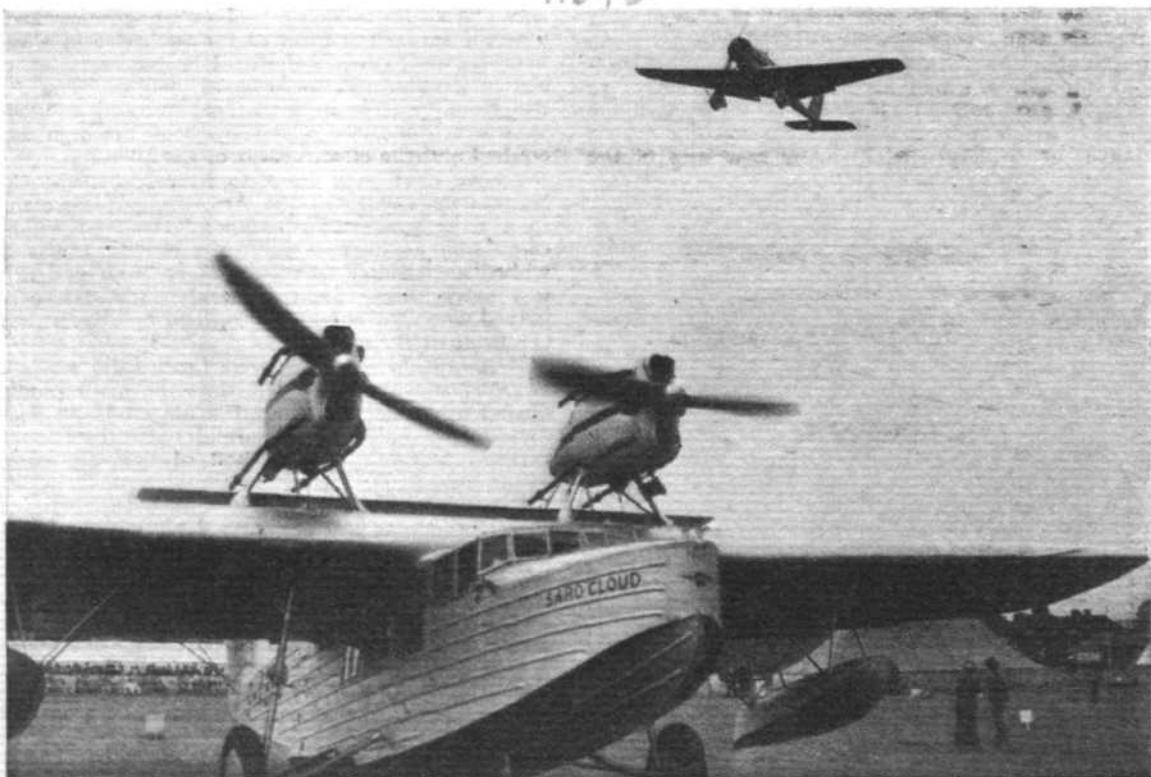
The Hawker P.V. dive bomber aeroplane looks, and presumably is, a derivation of the Hawker "Hart." Being in the dive bomber class it is designed to very much higher load factors than is usual in order that dives considerably in excess of 300 m.p.h. can be made with its "Pegasus" full on.

The Hawker single-seater fighter which formed the second part of the Hawker demonstration was the first machine so far shown during the Display with a Rolls-Royce engine, and its "Goshawk" roared in a healthy, if smoky, manner. At an early stage in a climb from a dive, this machine was turned on its back and the climb continued in this position, showing that it is as controllable that way as in any other.

Both the terrific climbs and dives were exhibitions of unusual piloting skill, particularly in judging the lengths to which the climbs could be carried in order to obtain as spectacular effect as possible without stopping the engine.

The De Havilland "Comet" (Flight, September 20, 1934) was the only machine of the D.H. range which was demonstrated in the air, although there were many other types on display on the aerodrome. For the first part of the demonstration Mr. Buckingham flew the "Comet" across the aerodrome many times at high-speed with the undercarriage wheels in an extended position, but these were retracted later on, and although the actual effect was probably not really visible, the machine certainly seemed faster. Anyone who says that aeroplanes are not things of beauty ought to see the "Comet" flying. Its tapered wings and narrow fuselage make it outstanding in this respect.

The last demonstration of the morning was that of the Percival "Mew Gull" (Flight, March 27, 1934), one of which has been entered for the forthcoming King's Cup Race by the Duke of Kent. The shape of the tail units has been altered slightly and the fuselage lengthened. The diminutive size of the whole machine made it, quite apart from its performance, an object of outstanding interest. With the D.H. "Gipsy Six" engine, the cruising speed is 185 m.p.h.



The Handley Page H.P. 47 general purpose monoplane (Bristol "Pegasus") flying above the Saro "Cloud" amphibian (two Napier "Rapier" engines). (Flight photograph.)



FLYING the "HORNET MOTH"

A Pilot's Impressions of the "Moth's" Successor : Capt. de Havilland's Idea of What the Private Owner Really Requires

By C. N. COLSON

AFIRST trial in the air of a new aeroplane is always filled with interest, and when the trial is of a machine the evolution of which has been the subject of an unusual amount of experimentation, it is likely to be even more interesting.

Knowing the lengths to which Capt. de Havilland and his staff have gone to perfect the "Hornet Moth" as a machine suitable in every way for the private owner and for club flying instruction, I was naturally very keen indeed to try it out.

The opportunity came on Tuesday of last week, when the company arranged to have the latest production model available for me at their Hatfield aerodrome; and let me say right away that the realisation was even better than the anticipation—a pleasure which is not given one very often in life, for the adage that the pleasure lies in the chase is truer than most such sayings.

Structurally the "Hornet Moth" was very fully dealt with in *Flight* of June 20, and so there is no need to go into that aspect here. I would, however, like to point out that it is quite a fallacy to say—as some are wont, in a sweeping sort of way—that wooden construction must necessarily be old and out of date. Nothing is farther from the truth. De Havillands are the last firm to stick to anything which is antiquated when a newer and better form of construction is available. The fact is, they tried steel construction for light aeroplanes many years ago, and, after marketing a machine with a welded-steel-tube fuselage—a type which was used widely all over the world—they came to the conclusion that a modernised form of wooden construction was undoubtedly better, feeling

that it gave the purchaser a machine with a better performance for the same horse-power, was cheaper, could be repaired more easily, and, in fact, there were many advantages which could not be given with metal construction in machines of this size, particularly those intended for this market.

Starting with the "Leopard Moth," this modernised wooden construction has been used for a number of new types, and the user of the "Hornet Moth" now gets something which has been tried out in every way. As a matter of fact, the period of gestation of the "Hornet Moth" has been one of over eighteen months. This was because Capt. de Havilland was determined to produce a machine which came as near as possible to satisfying all the requirements of the private owner and which was also admirable for club instruction.

Even to approach pleasing everyone would be an achievement of outstanding merit; but to accomplish it—because, critical as I am, I fail to see any real reason for anyone to want anything in the "Hornet Moth" changed—is an achievement for which ordinary adjectives are inadequate.

Aeroplanes in this class always divide themselves, in my mind, into two groups: those which are so stable that they wallow back to their flying position if left to themselves, after even the most serious movements of the control surfaces, and those having well-balanced controls which invite you to use them, but which are more often than not accompanied by the necessity of "flying" the machine the whole time—that is to say, the sort of machine of which you cannot let go for a moment. Both types have their attractions. The former is more the American idea. The

The D.H. Hall Mark : A fine view which shows the heavily tapered wings of the "Hornet Moth," a distinctive feature of all modern De Havilland aeroplanes. (Flight photograph.)

round and bite him" if he leaves go of the controls for a moment while he eats his lunch or gets out other maps. Yet even with these features it is so manœuvrable that one instinctively wants to throw it about. Actually, as has already been pointed out, it will not be sold with an aerobatic certificate although stressed for it, as certain modifications to doors and seat harness would have to be made which would add to the price, and which, it is considered, would seldom be used by the majority of private owners.

Easy to Fly

Another fascinating point about the controls is the way in which it is possible to fly and make turns quite accurately on ailerons or rudder alone. It certainly adds greatly to the comfort of a machine if one can, with impunity, become almost careless with the controls without immediately getting oneself into trouble and danger. By that I do not mean that there is nothing to be gained by flying the "Hornet Moth" in the proper way; there is, but to have the side areas so well balanced that a turn is almost automatically correct even without the use of rudder means that by far the greater number of pilots will, in a far shorter time, become thoroughly at home in that machine than would otherwise be the case.

controls are not necessarily heavy, but they generally require considerable movement, and the degree of positive stability is so pronounced that if the machine is good it will right itself after displacement and literally fly itself. The latter type is more British, and has to a certain extent grown up because after the War we were imbued with military ideas which laid down as an irrefutable dictum that a machine must be tolerably difficult to fly if the pilots trained thereon were to be good pilots. Moreover, that type of machine was neutral or even slightly unstable on all axes, with large effective controls, so that it was ideal for aerobatics but had the disadvantage that when used for long, and perhaps tiring, cross-country flights it had to be flown the whole time and watched carefully, otherwise a sleepy pilot might suddenly find himself in a spin.

Now, both types have their uses and are likeable in many respects, but unfortunately their characteristics are incompatible. It is easy to make a stable machine, but it will not be one which can be aerobatted easily, and vice versa.

Capt. de Havilland has, in the "Hornet Moth," done the seemingly impossible and produced a machine which embodies almost all the desirable features of both types. It is adequately stable, and, when trimmed by accurate rigging laterally, and fore and aft by a "tab" on the elevator, can be flown hands off for long distances; and even in bad conditions the pilot need never fear that it will "turn

In order to obtain such superlative controls, an enormous amount of test work was done, and as an illustration of the lengths to which the firm has gone I would mention that the wing tips are of a slightly different section from the inner portions of the wings, while there is also a definite washout of incidence, so that the ailerons are the last part to stall, and even at that point the stall is so innocuous that it can instantly be corrected.

I tried stalling with engine on and engine off. In both cases the hand of the A.S.I. was virtually "off the clock," and the stall was but the gentlest of dips. One wing generally dropped slightly, but could be lifted even during the subsequent drop of the machine itself. There was no dive, and the drop was, practically speaking, only that necessary to bring the fuselage back to its normal cruising attitude. There was absolutely no tendency to spin, and that manœuvre would have had to be deliberately induced by excessive use of the rudder at the stall.

Another thing which pleased me about the controls was the fact that, at cruising speed, they all required almost exactly the same pressure for operation and also were delightfully positive; there was no lag or sogginess, so that the response of the machine to control movement was almost instantaneous.

Air brakes of the type used in the "Leopard Moth" are fitted, and they effectively steepen the glide. I tested their





The amount of windscreens visible in this head-on view of the "Hornet Moth" shows the success of the designer's efforts to provide the pilot with a good outlook. (*Flight* photograph.)

actual effect during a prolonged glide, after a climb to the clouds for the photographs with which this article is illustrated, and found that at a steady 80 m.p.h. the time to descend from 9,000ft. to 8,000ft. without the air brakes on was 1 min. 10 sec., and from 8,000ft. to 7,000ft. with them on was only 50 sec.

Side-slipping presented no difficulties, as could be expected from other evidence of the well-arranged side areas. If the pilot wishes he can indeed swish the "Hornet Moth" about or perform any of the other evolutions to make spec-

tacular landings; but even with this propensity the machine is still one which can be brought in steeply and landed both slowly and gently with the greatest of ease.

I suggested to Capt. Hubert Broad, the de Havilland chief test pilot, that the "Hornet Moth" was a machine upon which a larger percentage of mediocre pilots could be expected safely to correct bad landings than on any other of the lighter D.H. machines, and he agreed with this impression.

The cockpit arrangement has already been dealt with



The new "Hornet Moth" in the clouds—those which heralded last week's thunderstorm—at 10,000 feet. (*Flight* photograph.)



Although a biplane and a cabin machine, the "Hornet Moth," as this view shows, is clean aerodynamically. The undercarriage compression leg is an oleo type by Dowty, and the sloping windscreen is a curved one-piece one of celluloid. (Flight photograph.)

quite fully. From the pilot's point of view the outlook is as good, if not better, than he gets in other cabin machines, and that despite the fact that the two seats are side by side; if the blind over the transparent cabin roof is kept drawn back during turns the area which can be kept under observation is almost as good as that in an open machine.

One of the hopes of Capt. de Havilland is that the "Hornet Moth" will replace the "Moth Major" or similar types for instruction. He maintains and I think very rightly, that beside the instructor is the best place for the pupil. He also feels that the use by flying clubs of this machine will not only enable safe pilots to be turned out in less flying time—and therefore more cheaply—but that, because so many of them afterwards fly cabin machines, they will be fitter pilots to do this at an earlier period in their careers than before. Conversation is easily carried

on, as the noise is, perhaps, a little less than in a "Leopard Moth," although I fancy that better padding on the top of the very ample-sized luggage compartment and on the bottom of the fuselage would reduce the noise from the exhaust considerably, and make the machine better still in this respect.

It is very easy to criticise destructively, and before one suggests other ways of doing things on an aeroplane it is as well, before giving vent to criticisms, to discover what means have been tried to improve any particular point. In the case of the "Hornet Moth" Capt. de Havilland has virtually taken the wind out of critics' sails by anticipating their criticisms. So thoroughly has he been into every item that no ordinary pilot, unconnected with the construction, is really competent to do other than describe the machine as he found it—and that is what I have endeavoured to do.

OUT of the FARNBOROUGH HIVE

The "Queen Bee" Buzzes in Public : Veil of Secrecy Partly Lifted from a Wireless-controlled D.H. Military Machine

FOR some years past experiments have been going on to perfect the radio-controlled aeroplane. Naturally, as is generally the case with secrets about which most people know everything, we were not allowed to say anything, but now permission has been given to divulge the bare details of this interesting development.

If its promise is upheld then we shall possibly have future wars fought by dear old gentlemen sitting in armchairs in Whitehall twiddling taps while opposing fleets of aircraft obey the twiddling many miles above the earth, as if in a glorified game of chess. All we shall have to do is draw our profit from constructing aeroplanes in the seclusion of bomb-proof works.

The machine used for these experiments is a D.H. type called the "Queen Bee," which is virtually a "Tiger Moth" with a wooden fuselage. It has a "Gipsy Major" engine, giving the machine the normal performance for this type. The rear cockpit contains the controlling mechanism, about which nothing further can be said.

The "Queen Bee" has largely been used for target practice from H.M. ships, and has the necessary fittings built in so that it can be catapulted off to start its lonesome flights. Either a float undercarriage or wheels can be fitted, according to work for which it is used.

All normal manœuvres are said to be possible, including aerobatics, but so far the controllable range of flight is only about ten miles.

Those who know anything about the radio control of ships will readily understand the possibilities as applied to aircraft.

especially when it comes to operation of separate items like the throttle lever, control column, and navigation lights.

The "Queen Bee" does not at present carry bombs or a torpedo, but that should not be an impossibility.

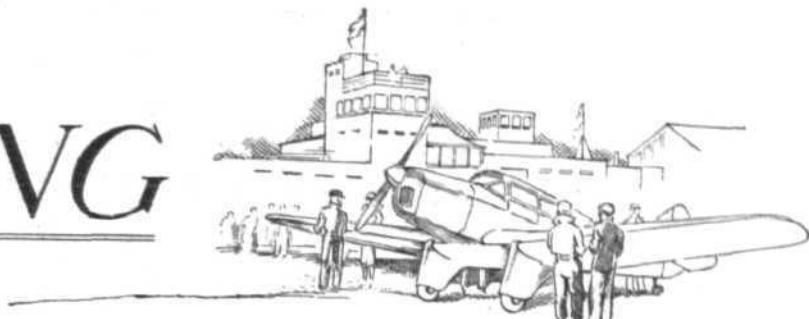
A demonstration given at Farnborough on Wednesday of last week showed very clearly the wonderful progress which has been made with this adaptation of radio transmission. Owing to the proximity of houses, a pilot was carried for safety purposes, but he did not touch the controls. The "Queen Bee" took off, was turned left and right and finally landed on the aerodrome, solely by the radio controls operated by an officer on the tarmac. The control panel is a small box with a series of buttons on the top marked straight, turn left, turn right, dive, climb, glide, and so on, and when these were pressed in response to orders from the officer the machine followed without lag or hesitation.

Evidently there is some connection between the controlling mechanism and a sensitive-reading altimeter, as the machine automatically flattened out from a dive at a predetermined height; moreover, it would seem probable that some form of bob weight is probably used to determine the height at which the "stick" shall be brought right back when a landing is made.

Some success has been made with controlling two aircraft in the air at the same time, but, as yet, formation flying has not been found possible.

The "Queen Bee" (a photograph of which appears on the "Four Winds" page of this issue) was present at the R.A.F. Display at Hendon last Saturday.

PRIVATE FLYING



TOPICS of the DAY

The Operational Centre

IN spite of the fact that there are something like seventy licensed civil aerodromes in this country, it is still obvious that the majority of prospective private owners must live far enough away from one or another for surface transport to be a definite tribulation. To be able to reach one's aerodrome in ten minutes means not only that one can spend odd half-hours in inspection and detail maintenance but that a private aeroplane can be useful for quite short as well as comparatively long journeys.

However, a number of people are lucky enough or wealthy enough to be able to make use of large fields, or even to lay out their own private aerodromes. In these days of split-axle undercarriages the problem of grass length is not so acute, but grass grows surprisingly quickly in spring and summer, and the mowing even of runways in a large field is no small task. However, one presumes that the man who can afford to use his own field can also afford to pay for its maintenance.

Furthermore, he has the responsibility of seeing that there are no serious surface irregularities, or, at least, of remembering where these are. Pilots who have pulled off successful forced landings in big fields usually find that a good deal of work would be necessary before such fields could be really safe for day-by-day operations with a light aeroplane.

Housing the Machine

THE hangar question is by no means as serious or as expensive as one might imagine. An adequate shed can be built for a matter of £30, or even less. This, however, should be at least fifteen feet in width, for one's first aeroplane is not likely to be one's last, and the odd inch in folded width can make all the difference in the world. The low-wing monoplane, for instance, when folded, takes up rather more space than the conventional biplane, with which so many people make a start.

Plain corrugated iron appears to be fairly satisfactory so long as it is painted with red oxide some six months after its erection, and such construction, too, allows a certain amount of ventilation. Unless carefully designed the doors are liable to be a problem. If each is seven or more feet in width they are naturally heavy, and "steps" should be arranged for both the open and closed positions. Needless to say, they should have some substantial attachments to keep them in the open position or the luckless owner is almost certain to touch one or other with a wing or a tail plane in due course.

One private owner I know has built a little railway down the centre of his hangar with a track of some fifteen inches. On this runs a trolley on which the tail skid of his machine rests in a metal cup. As the rails are made to project three feet beyond the doors, he can wheel his machine out with the certain knowledge that, once clear, he can unfold the wings without risk of damage. Furthermore, this job

can be done single-handed. Every hangar, of course, should be equipped with a small table or bench. A single window opposite the doors is probably all that is necessary in the way of lighting.

The Fuel Supply

THIS same owner originally kept his petrol in a fifty-gallon underground barrel, using a partly flexible pipe, reaching to its base, for delivery. Into the bung of the drum he fitted a pneumatic tyre valve, and used a foot pump to force air into this drum and so urge the fuel into his machine. However, he found that the delivery was very slow and has given up the system. He now keeps half-a-dozen two-gallon tins in the hangar and arranges his major refuelling at visited aerodromes.

Another private owner has an underground storage tank—so, incidentally, obtaining his petrol at a cheaper rate—and a small overhead tank from which the fuel is actually led to his machine. He uses a semi-rotary pump to refill the gravity from the storage tank. This job can be done when he has a moment to spare, in much the same way as the yachtsman deals with his bilge water.

This Racing Business

ORGANISERS of small air races appear to be between the devil and the deep sea. Cross-country racing provides no real spectacle for the general public, and without such support it is not usually possible to offer large cash prizes for the winners. One race, that for the King's Cup, is quite strongly supported by manufacturers as well as by amateur pilots, largely because, in the case of such a well-known event, the manufacturers of both the winning and the fastest machines have a reasonable chance of obtaining some useful publicity.

Needless to say, the average entrant for one of the smaller races enters for the sport of the thing and not in the hope of obtaining either direct or indirect monetary advantage. Nevertheless, one can hardly expect a private owner to hold his throttle lever fully forward for several hours unless there is some useful reward for the mechanical risks he is taking. Modern engines will usually survive under the most gruelling treatment, but a sudden seizure—plus the possible damage resulting from a forced landing made in an almighty hurry—can be very expensive indeed. Furthermore, of course, if the pilot is to stand a chance of beating the handicappers he must spend a certain amount of money in preparation.

No one will deny that the pilot enjoys himself immensely. Flying all-out at no altitude for several hundred miles can be most exciting, but unless there is a large entry the general public attending the event is frankly bored. It might be possible to attract them by staging pylon races with slow and safe machines—dirt-track speeds, for example, are only high in relation to the size of the track—but in that case the racing would be almost valueless as a means of improving the breed.

INDICATOR.

Private Flying

FROM THE CLUBS

Events and Activity at the Clubs and Schools

MIDLAND

FLYING time last week at the Midland Aero Club was 37 hours, and Mr. J. L. Thomson made a first solo. New members include Mr. J. L. Spicer (flying) and Mr. F. H. Ryder (ordinary). Cross country flights were made to Sywell and Hatfield.

ABERDEEN

During the week ended June 26 flying times at the Aberdeen Flying School were: dual 2 hr. 45 min., and solo 1 hr. 20 min.

WITNEY AND OXFORD

The Club has had a very busy week. Three members—Messrs. W. E. H. Noel, P. E. Lawrie and H. A. Glogauer—passed their "A" licence tests, while Mr. A. O. Cundy made a first solo. Four new members joined, and the flying times totalled 22 hr. 55 min.

REDHILL

Last week 89 hr. 5 min. were flown by the Redhill Flying Club and Messrs. Bissmarck and Pahnquist passed their "A" licence tests. One new member started his blind flying course for "B" licence endorsement, and Messrs. E. S. Baker and H. A. Dalrymple-White joined the Club.

HULL

The Directors of the Hull Aero Club have decided to proceed immediately with the flying scholarship scheme and this scheme started, in fact, on Monday last. Applicants will be chosen by means of trial flying lessons, and 25 per cent. of those applying will be trained for their "A" licences for a fixed sum of £15, which will include their Club membership fees.

NORTHAMPTON

During the week-end machines arrived from seven aerodromes. The pilots and passengers of these had come to inspect the Reserve School buildings. Lord Willoughby de Broke arrived in his Klemm "Eagle," and Lady Willoughby brought a Klemm "Swallow." Several of the club members flew the "Swallow" on Sunday afternoon. Capt. Davis took over the instruction for the week-end.

Mr. W. S. Abbott has completed all tests for his "A" licence.

YORKSHIRE AVIATION SERVICES

Last month's flying hours showed a large increase over those of the same month last year in spite of the fact that bad weather was the order of the day, and that one of the school "Moths" has been undergoing its C. of A. overhaul. Three new pupils—Messrs. Vincent, Chisholme and Radcliffe—joined the school, and Capt. Bruce-Norton made a first solo. The "Puss Moth" has been very busy on taxi work, and last week-end a party was taken to the R.A.F. Display.

AUTOIRO

Three new pupils—Messrs. Jacob Mees and H. J. Van der Velden from Holland, and Mr. J. P. Phillipps—have commenced instruction at the Autogiro School, where 47 hr. 15 min. were flown. Lt. G. Pino, of the Royal Italian Navy, who has been trained from the *ab initio* stage, made a first solo and Flt. Lt. F. K. T. Bullmore, one of Sir Alan Cobham's pilots, completed all tests for the endorsement of his "B" licence. Mr. Max Stoker also made the usual cross country flight from Croydon to Lympne at night for his "B" licence.

YORK COUNTY

As was reported in *Flight* last week Mr. Robert Blackburn has purchased the aerodrome at Sherburn-in-Elmet, but the York County Aviation Club will carry on, though certain radical changes for the improvement of the amenities are being contemplated. F/O. H. D. Primrose has become chief instructor.

Tickets for the Summer Ball, which will be held on July 19, are in great demand, and the complete accommodation for the three local hotels has been reserved for that night.

Twenty-eight new members joined last month, a figure which constitutes a record in the Club's history, and first solos were made by no fewer than seven members. Messrs. Gullick, Simons and Moore passed their "A" licence tests.

BROOKLANDS

Although this week's report is for the week ended June 28 the month's flying hours had already reached a total of nearly 500. During last week Mr. Appleton made a first solo and Mr. Uniacke passed his "A" licence tests and the visitors included Mr. and Mrs. Mollison, who demonstrated their Beechcraft. Among the new members is Viscount Forbes, who is taking his "A" licence.

On Sunday of last week a navigation competition was held, the winners being Messrs. Holbeach, Morris and Smallman.

Capt. Duncan Davis spent part of the week making his bi-annual inspection of Lympne and then went down to Shoreham to complete arrangements for taking over the Club, sales and service departments for the new airport. Negotiations with both the old club and Oiley Air Service, Ltd., are going on well.

CAMBRIDGE

Forty-nine hours were flown by Marshall's School last week and the "Jubilee" Monospar was demonstrated on Friday.

Eleven members of the C.A.S.C. attended on Sunday. All of them flew, Mr. Fletcher made his first solo and Mr. Jessett came again on Tuesday and also went solo.

YORKSHIRE

Last week's flying time of 72 hr. 40 min. at the Yorkshire Aeroplane Club included some 25 hours flown abroad by Messrs. Moody and Rhodes in the "Puss Moth," who made quite an extended tour of France, Germany and Austria. Several interesting charter trips were made.

LIVERPOOL

A Cross Country Competition was held by the Liverpool and District Aero Club at Speke on Saturday, June 22, the first three being Messrs. W. K. Crawford, W. Grenhalgh, and E. Bibby. Throughout the past week the weather conditions have been good and the flying time totalled 87 hr. 30 min.

HATFIELD

On Sunday of last week the London Aeroplane Club had a record day's flying with a total of 33 hr. 30 min., while only five machines were in use. During the whole week the total was 163 hr. 5 min. New members are Messrs. D. A. Adkins, H. J. Blackshaw, G. M. Chapman, H. B. Courtney, R. C. Empson, F. L. Ingall, A. E. Wells, and Miss W. B. Rose. Mr. J. R. Gleed made a first solo.

TOLLERTON

On Saturday, June 22, a Garden Party was held at the aerodrome by the Tollerton Aero Club. During the afternoon the annual competition for the Nottingham Journal Challenge Trophy was run, and was won by Mr. R. Winn, of the Leicestershire Club, who was flying a "Puss Moth." The runner-up was Mr. E. D. Wynn, of the home club who, curiously enough, was also flying a "Puss Moth."

The flying time for the week ended June 27 totalled 51 hr. 42 min., and three new flying members joined.

BRISTOL AND WESSEX

The Bristol and Wessex Aeroplane Club have sustained a severe loss in the death of Mr. Arthur Taylor, who has been Honorary Treasurer since the Club's inception at Filton more than eight years ago. Mr. Taylor, who was senior partner in a well-known firm of chartered accountants, also rendered valuable services to the Bristol Corporation as Honorary Financial Advisor to the Airport Committee.

Five new members joined the Club last week, during which the flying time totalled 60 hr. 20 min. Mr. Bruce Douglas completed his "A" licence tests, and on the 22nd three machines flew over to Eastleigh, where the pilots and passengers were entertained to breakfast by the Hampshire Club.

CINQUE PORTS

On Wednesday and Saturday of last week a machine, with blind and night flying equipment, was flown over to the Kent County Fair at Maidstone by Mr. Leslie Cliff and exhibited there. Mr. Cliff put up an aerobatic display in the beams of two searchlights, and finally flew around with both wing tip flares alight. Capt. Duncan Davis has been spending a few days at Lympne and put in some hours of instruction during the temporary absence of Mr. K. K. Brown on a charter trip with the "Leopard Moth" to Paris.

Mr. L. E. Moore, a member of the ground staff, has obtained his "A" licence, and first solos were made by Mrs. Graham Watson, Mr. S. E. Edwards and Mr. "Bill" Annesley. The flying time for the week ended last Thursday totalled 79 hours.

Among the four new flying members is Mrs. G. E. M. Calthrop who, incidentally, designed and executed scenery for several Coward-Cochran shows.

KARACHI

The flying time for May amounted to the modest total of 205 hr. 10 min. This is as great as the club had any reason to expect in view of the fact that, apart from two cabin machines, only one "Moth" was available for training.

For the Silver Jubilee the "Leopard," "Puss" and "Gipsy Moths" flew over to Mirpurkhas to take part in the celebrations. In three days these machines flew for over 30 hours and carried more than 350 people. The majority of the passengers had never before seen an aeroplane close at hand. Incidentally, Mirpurkhas, the greatest cotton centre in Sind, badly needs an aerodrome; this matter, in fact, is now receiving the attention of the Director of Civil Aviation.

Although May is not a particularly pleasant month for cross-country flying in the vicinity of Karachi, approximately 50 hours were flown. At the end of the month the club decided to purchase a "Gipsy II"-engined "Moth" from the Jodhpur Flying Club.

THE S.B.A.C. "STATIC" DISPLAY

AMONG members of the British aircraft industry a considerable amount of discussion has taken place concerning the advisability of holding an aero show at Olympia. The consensus of opinion was that, although it was realised that the general public is now very much more interested in air matters than was the case a few years ago, the expense entailed in exhibiting in a building such as Olympia is so great, that few firms at the present time would care to shoulder it. The value of the S.B.A.C. Display and Exhibition at Hendon had been found by previous experience to be very considerable, and ultimately it was decided to hold it again this year, on much the same lines as previously, but on a somewhat larger scale.

Indoors and Outdoors

The S.B.A.C. Displays at Hendon are unique in that they permit potential customers to see the aeroplanes in flight, and, in many cases, to make flights in them, to inspect them thoroughly on the ground, and to examine the engines, components, accessories, and equipments in the "static" exhibition.

This year sixty-five members of the Society of British Aircraft Constructors took space, in aggregate power the machines shown accounted for more than 20,000 h.p., and the total value of the aircraft, engines, material, and equipment was in the neighbourhood of £500,000.

Participation in the Display was limited to members of the S.B.A.C., the chairman of which this year is Sir Robert McLean, chairman of Vickers

Engines, Components and Materials of Great Interest to Visitors : British Manufacturers Prove that They Are Well Abreast of Every Phase of Design

(Aviation) Ltd., who has as his deputy chairmen Mr. H. Burroughes, of the Gloster Aircraft Co., and Air Vice Marshal A. E. Borton, of D. Napier and Son. Mr. John Lord, joint managing director of Saunders-Roe, is treasurer of the S.B.A.C.

On the following pages will be found an account of the "static" exhibits, which, like the S.B.A.C. flying display, proved extremely interesting to visitors, foreigners especially. The flying display which took place last Monday is dealt with elsewhere in this issue.

Engines

THERE are new types of British aero engines now on the market, or soon to be available, which, due to their unorthodox design and consequent high efficiency, have no rivals abroad. The more conventional patterns presented by British manufacturers, taking advantage of recent developments and in several cases using fuels of higher octane value than hitherto, are giving amazingly high outputs for extremely low

weights, and, unlike the bulk of foreign competitors, are capable of being run for long periods between overhauls.

Four of the Armstrong-Siddeley range of engines were exhibited at the S.B.A.C. Display at Hendon last Monday. In the order of horsepower they were the fourteen-cylinder "Tiger VI," the fourteen-cylinder "Panther VII," the seven-cylinder "Cheetah VI," and the seven-cylinder "Genet Major."

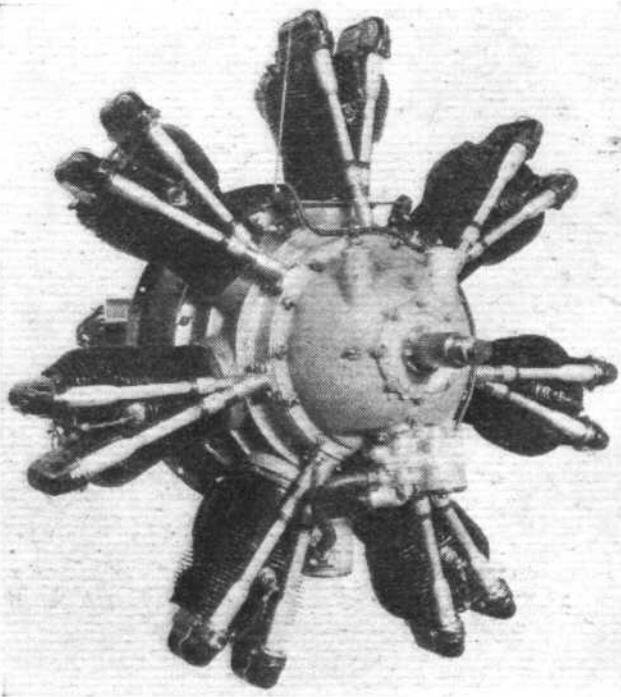
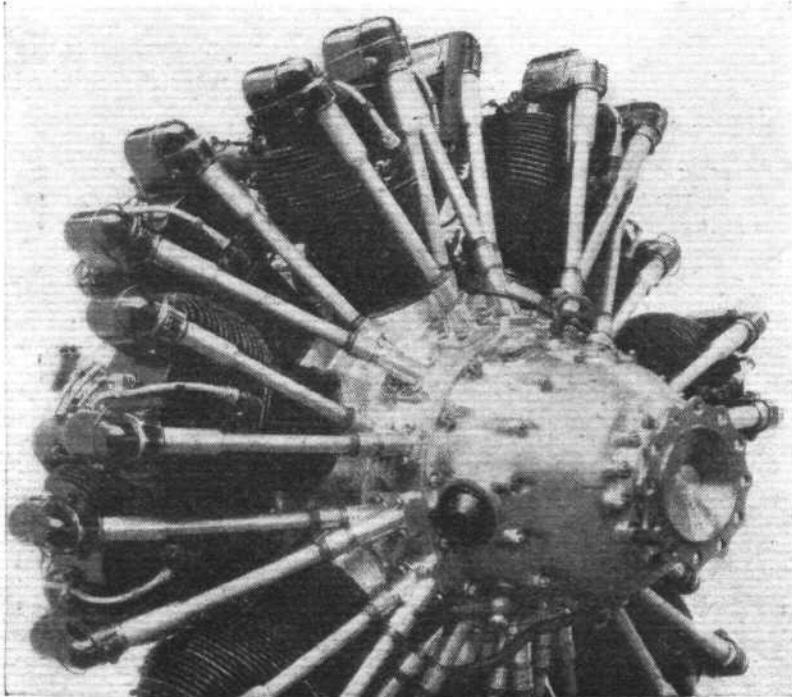
As the "Tiger VI" was fully described and illustrated in *Flight* of June 20, 1935, it will suffice to recall that it gives 760 b.h.p. at a rated height of 5,000ft., and that it is both geared and supercharged. The "Panther VII" is also a geared and supercharged engine, but is supercharged to 12,000ft., at which height the normal rated power is 560 b.h.p. The supercharger impeller is driven through three sets of double-train spur gears at 12.9 times engine speed. The degree of supercharge is controlled by an automatic boost control set at rated boost.

Moderately Supercharged

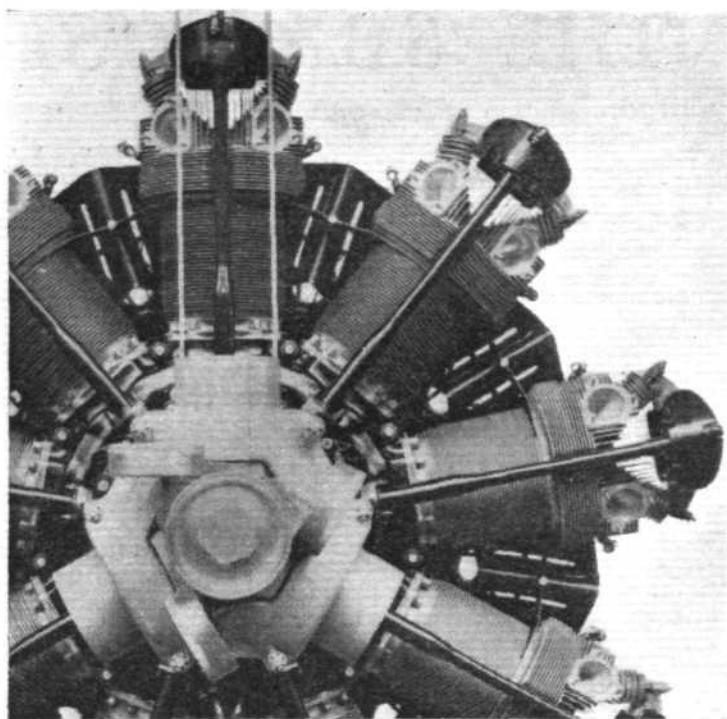
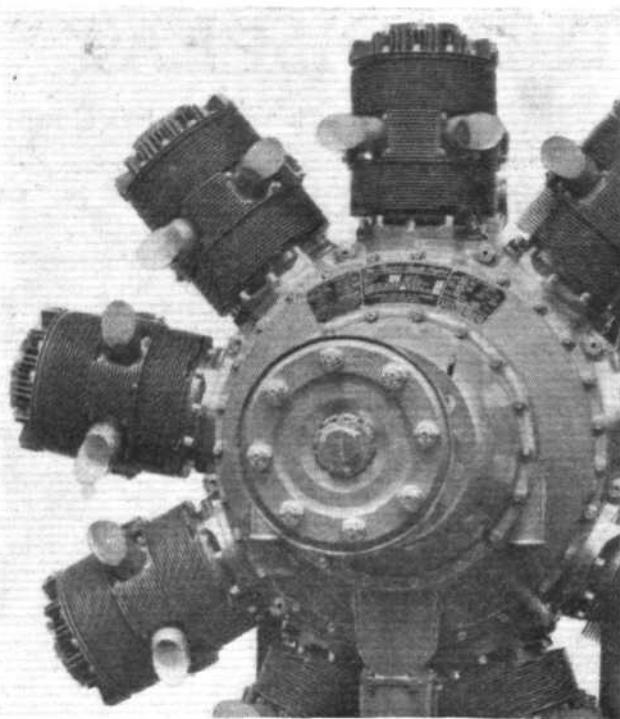
The "Cheetah VI" is a moderately supercharged ungeared engine rated at 290 b.h.p. at 2,100 r.p.m. at 6,000ft. The engine is, in effect, one half of the "Panther," i.e., one of the two rows of "Panther" cylinders, and is fitted with all the latest improvements, such as close-finned cylinders. It can be mounted on the same bearer ring as the "Lynx," thus providing a great degree of interchangeability of installation.

For use in light aircraft there is the seven-cylinder "Genet Major" of a normal power of 140 h.p. Perhaps this engine has become best known as the standard power plant of the Autogiro. It is remarkable for its extremely smooth running.

Apart from the "Aquila" in the "Bullpup" and the V.P.-fitted "Mer-



Two Armstrong-Siddeley engines : On the left is the fourteen-cylinder, 760 h.p. "Tiger VI," which is geared and supercharged. On the right is the 290 h.p. "Cheetah VI" direct-drive moderately supercharged type.



The "Aquila" is the smaller of two Bristol sleeve-valve engines, and is rated at 450 h.p. The "Pegasus X" shown on the right achieves the amazingly low specific weight of 1.08 lb. per horse-power.

cury in a "Bulldog," five Bristol engines were shown in the "static" exhibition. Of these the sectioned "Pegasus" was particularly interesting because it showed the "works." The "Mercury VI S" was, of course, similar to that installed in the "Bulldog," and the "Aquila" and "Perseus" sleeve-valve engines, of 450 h.p. and 650 h.p. respectively, were shown in this country for the first time and thus, naturally, attracted great attention. Simplicity of construction, ease of maintenance, and low fuel consumption are some of the advantages associated with sleeve-valve engines.

Perhaps it may be said that the *pièce de résistance* on the Bristol stand was the new "Pegasus X." This name should, of course, be pronounced "Pegasus Ten" and not "Pegasus Ex," there being nothing of an "unknown quantity" in this engine, which has passed its type tests with flying colours and is a very remarkable engine in that for a weight of 995 lb. it develops 920 b.h.p., so that the specific weight is but just over one pound per horse-power.

This engine has a lightened reduction gear for the airscrew, fitting of the De Havilland controllable-pitch airscrew is

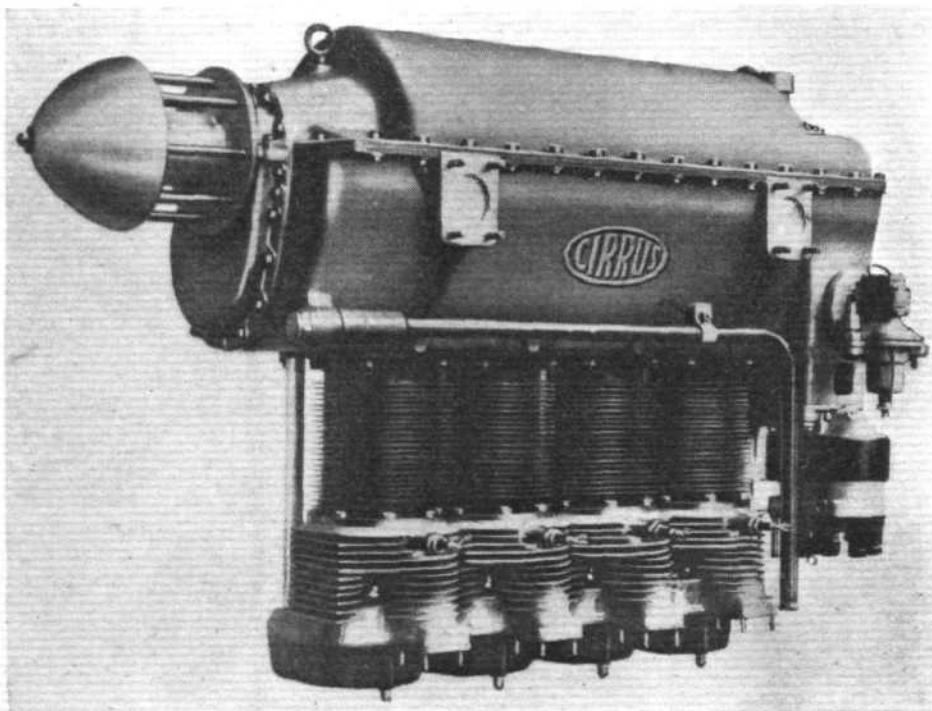
standardised, and an oil valve for the control of the pitch is incorporated. In addition, the engine has sodium-cooled and stellited exhaust valves and stellited valve seats, so that it will be seen that altogether the "Pegasus X" is just about the last word in air-cooled radial aero engines.

Two new light aircraft engines which attracted a good deal of attention, because they were shown in public for the first time, were the "Cirrus Minor" and "Cirrus Major," made by the Cirrus-Hermes Engineering Co., Ltd. The former, it will be remembered, is a four-cylinder in-line inverted air-cooled engine of 3,605 c.c. capacity, rated at a normal power of 70 b.h.p. at 2,200 r.p.m., and weighing 210 lb. complete. For small two-seater aeroplanes, or for use in twin-engined four-seaters, the "Cirrus Minor" should provide a very economical power plant.

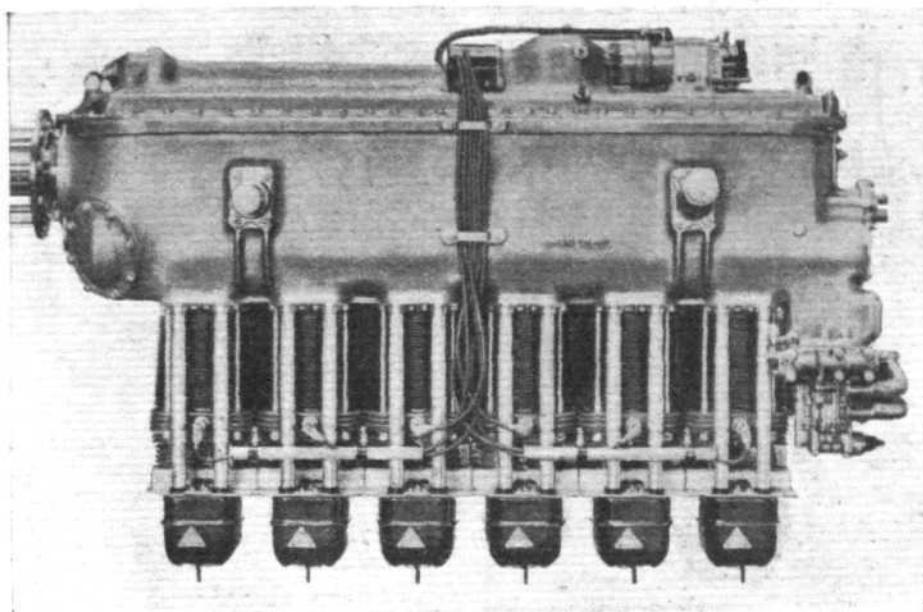
In Production

The "Cirrus Major" was fully described in *Flight* recently (June 13, 1935), and is, it may be recollected, also a four-cylinder inverted engine, but of larger capacity (6,330 c.c.) and greater power (125 b.h.p. at 2,100 r.p.m.). The weight of this engine, complete, is 310 lb. It passed its type tests a few weeks ago, and is now in production. Deliveries are due to begin almost at once.

Engines and controllable-pitch airscrews formed the "static" exhibits of the De Havilland Aircraft Co., Ltd. The two engines shown were a 200 h.p. "Gipsy Six," which was installed with its accessories in a specially illuminated nacelle, and a 130 h.p. "Gipsy Major." It may be recalled that a "Gipsy Six" was installed in the "Gull" monoplane on which Capt. E. W. Percival quite recently flew from London to Oran on the African coast and back in one day. Apart from the fact that the engine did a very good day's work, it



The "Cirrus Minor" four-cylinder in-line engine develops a normal power of 70 b.h.p. at 2,200 r.p.m. The "Cirrus Major" is of similar type, but is rated at 125 b.h.p.



The De Havilland "Gipsy Six," of 200 h.p., has been used on many well-known aeroplanes. A racing version was fitted in the "Comet" which won the England-Australia race.

brought Capt. Percival across the Mediterranean twice without a falter, thus justifying the faith he placed in it.

It will be recollected that about a year ago the De Havilland Aircraft Co., Ltd., acquired the British rights for the Hamilton Standard controllable-pitch airscrews. Production has now started in the specially-equipped shops at Stag Lane, and at the S.B.A.C. Display visitors had an opportunity of inspecting various models. One was a three-bladed, size 5,000 airscrew, suitable for the Bristol "Pegasus" engine. A size 4,000 sectioned airscrew hub permitted the working parts to be examined *in situ*, while the parts of a size 3,000 two-bladed airscrew laid out on a table gave an indication of the careful workmanship put into these airscrews.

The actual operation of the De Havilland C.P. airscrew was demonstrated with a size 3,000 airscrew.

Of the three Napier engines exhibited,

perhaps the "Culverin" was the most interesting in that, as far as this country is concerned, it is a novelty. As *Flight* readers will be aware, D. Napier and Son hold the British rights for the manufacture of the Junkers heavy-oil engines, and the "Culverin" is the first of these to be built at Acton. Shortly three "Culverins" will be installed in a Blackburn flying boat in order to try them out under actual operating conditions. It is, of course, well known that the Diesel type of engine is a good deal heavier than the petrol engine, but its fuel consumption is very low, and on a long flight the combined weight of engine and fuel may compare favourably with the corresponding weights of a petrol engine and its fuel.

The "Culverin" is a six-cylinder-in-line water-cooled engine working on the two-stroke compression-ignition principle. A feature of the design is that there are two pistons in each cylinder.

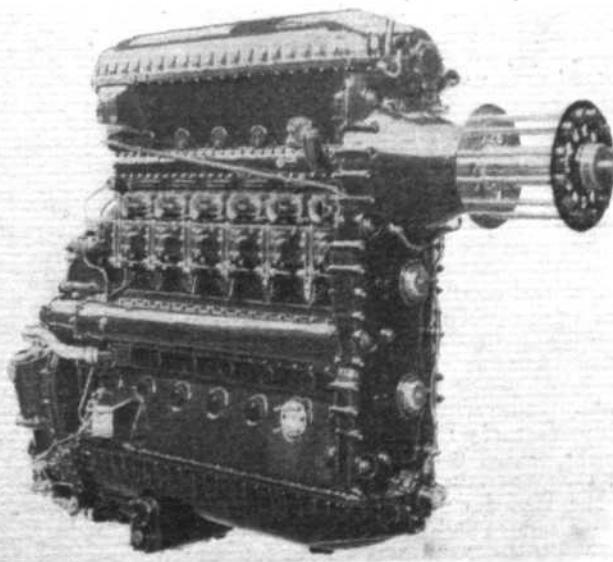
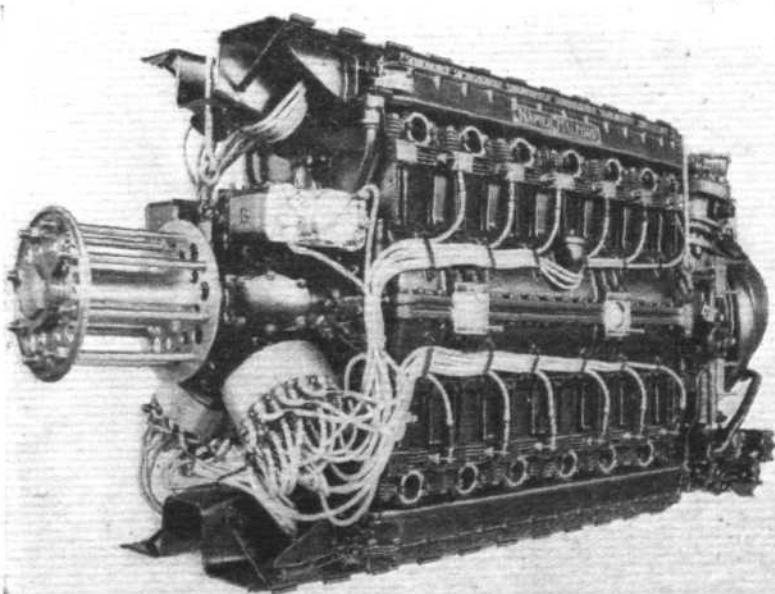
working in opposite directions. Consequently there are two crankshafts, which are geared together at the front end, and also geared to the airscrew shaft. The swept volume is 1,760 cu. in. and the engine develops a normal power of 720 b.h.p. at 1,700 r.p.m. and a maximum power of 795 b.h.p. at 1,950 r.p.m. The weight dry is 1,785 lb.

Several Napier-Halford "Dagger" engines are now in production, all 24-cylinder air-cooled types, with the cylinders arranged in four banks of six each, forming a letter "H" when seen from the end, *i.e.*, two vertical upright banks and two vertical inverted banks. At the S.B.A.C. Display a Series III "Dagger" was shown. This is a medium-supercharged engine which develops a normal power at rated boost of 700-725 b.h.p. at 3,500 r.p.m. at 3,500ft. and a maximum of 780-805 b.h.p. at 4,500 r.p.m. at 5,000ft. and rated boost. At maximum boost for take-off the power is 730-755 b.h.p. at 3,500 r.p.m. Owing to the relatively high speed, a high power output per litre has been obtained, *viz.*, 47 h.p. The arrangement of the cylinders has resulted in a very low frontal area, so that a horse-power of about 115 per square foot of frontal area has been obtained. The weight is 1,270 lb.

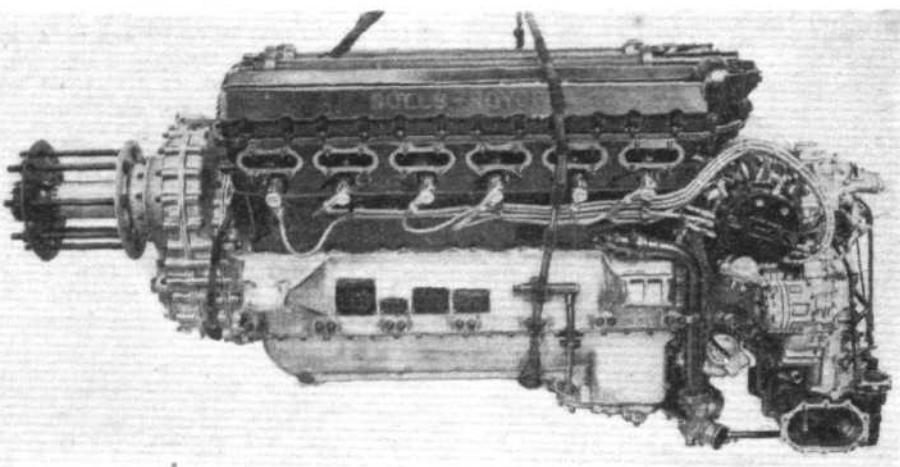
Improved Performance

The Napier-Halford "Rapier VI" is the latest addition to this series, and incorporates certain modifications which have resulted in improved performance. Like other "Rapiers," this is a sixteen-cylinder engine of the "H" type, rated at 345-360 b.h.p. at 3,500 r.p.m. at 4,000ft. The maximum power is about 400 b.h.p. at 4,000 r.p.m. at 5,800ft. The weight is 707 lb.

It had been hoped that some of the very latest Rolls-Royce types might have been exhibited at the S.B.A.C. Display. This, however, was not found possible, but the latest type of "Kestrel VI" was a worthy representative of the famous firm. Another "Kestrel" engine, completely cowled and fitted with Glycol radiator, which merges into the cowling close behind the airscrew, was also shown. This exhibit incorporated, also, a new exhaust system. Two pipes collect



For petrol and heavy oil: The Napier-Halford "Dagger," shown on the left, has twenty-four cylinders and develops 700 h.p. The "Culverin," on the right, is a compression-ignition engine rated at 720 h.p.



A Rolls-Royce representative : The "Kestrel VI," a fully supercharged and geared water-cooled unit, rated at 600 h.p. at 11,000ft.

from three ports each and discharge through a small hole in the cowling. A Fairey airscrew was fitted.

The "Kestrel VI" belongs to the fully supercharged class and is rated at 600 h.p. at 11,000ft., delivers 640 h.p. at 14,000ft., while the power available for take-off is 700 b.h.p. The weight of the engine dry is 975lb.

It is, perhaps, rather superfluous to remind readers that all the Rolls-Royce types, "Kestrels," "Goshawks" and "Buzzards" are twelve-cylinder Vee liquid-cooled engines. Recently yet another has been added to the series. This is now known as the "Merlin" (originally P.V.12), and is similar in a general way to previous Rolls-Royce engines but of higher power. It is to be regretted that it was not found possible to exhibit this engine.

The Wolseley Range

The Wolseley range of aero engines now numbers three types, all of which were shown at the S.B.A.C. Display. Generally similar in their design and structural details, the three engines differ in power and in the number of cylinders, while one, the smallest, has direct airscrew drive, and the other two have a reduction gear. All three employ geared fans in the induction system.

Beginning with the smallest of the Wolseley engines, the "Aquarius," this is a seven-cylinder radial (air-cooled), of 7,500 c.c. capacity which develops a normal power of 155 b.h.p. at 2,250 r.p.m., and a maximum of 168 b.h.p. at 2,475 r.p.m. A full description of this engine was published in *Flight* of May 16, 1935. The weight of the "Aquarius" is 375lb. and the type is intended mainly for training and "feeder line" types of aircraft.

Next in size in the Wolseley range comes the "Aries" Mark III. This was shown sectioned in order to give visitors an opportunity to inspect the working parts, and is a nine-cylinder radial of 9,650 c.c. capacity, rated at a normal power of 205 b.h.p. at 2,250 r.p.m., and giving a maximum of 225 b.h.p. at 2,475 r.p.m. This type, which weighs 510lb., is fitted with airscrew reduction gear, the ratio being 0.629:1.

The Wolseley "Scorpio," Mark I, is also a nine-cylinder radial, but of larger capacity, the swept volume being 10,530 c.c. Normal power at 2,250 r.p.m. is 230 b.h.p., and maximum power 250 b.h.p. at 2,475 r.p.m. The airscrew

reduction gear has the same ratio as that of the "Aries," and the weight complete is 536lb. Hydraulically operated tappets ensure constant valve clearances at all operating temperatures.

Wolseley Motors intend to pursue a vigorous aero engine policy, and doubtless a good deal will be seen of all their models during the coming months.

Engine Accessories

Probably the most important exhibit on the stand of the British Piston Ring Co., Ltd., was "Brilybdenum," a new piston-ring material, which has very high

tensile strength and elasticity to prevent "setting" and "toeing in" when subjected to great heat. Then "Brimol," which is austenitic in nature, has been introduced for employment in cases where leaded fuels are used.

A Gloster-Hele-Shaw V.P. airscrew suitable for a "Kestrel" was on the Gloster stand. Licences for the pitch-varying gear have been taken by the Bristol and Rolls-Royce companies.

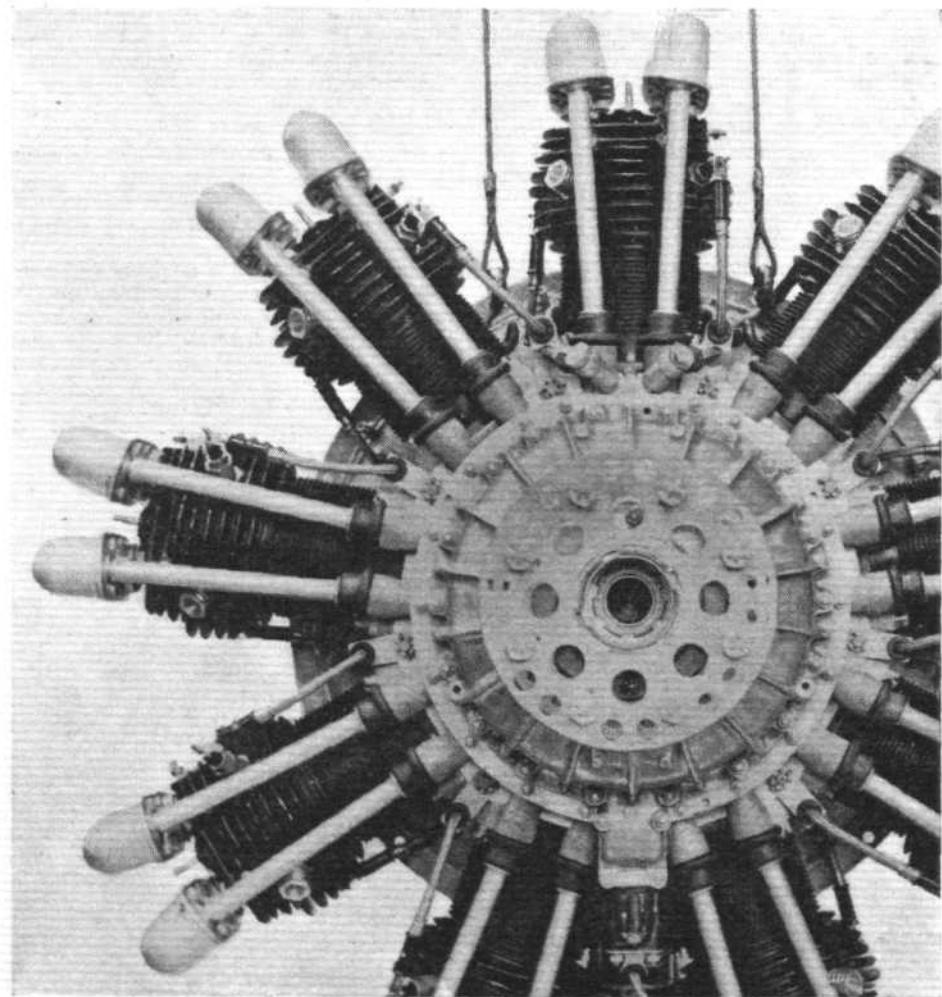
The display by the Light Production Co., Ltd., was confined to aero-engine piston rings, both of compression and oil-control types. These are made from centrifugally cast iron, those for ordinary use being made from an iron to Air Ministry specification 4.K.6.

Also on show were rings made in special-alloy irons, alloys of nickel-chromium and chromium-molybdenum. Also to be seen were various types of oil-control ring giving varying cylinder wall pressures.

New Material

Piston rings manufactured under the Gray and Howlett patent process from centrifugally cast iron comprised the exhibit of Wellworthy, Ltd. There were compression rings, bevelled and stepped scraper rings, and the "Superslot" oil-control ring. Of particular interest were display rings made from a new material, "Thermocrom"—which possesses, it is claimed great strength and elasticity.

There were also "Surelock" valve seat inserts.



Rated at a normal power of 230 b.h.p., the Wolseley "Scorpio" Mark I develops a maximum of 250 b.h.p.

The S.B.A.C. "Static" Display—

Finally, there were petrol priming pumps for aircraft.

A working model which clearly showed the *modus operandi* of the well-known Hobson automatic control system (which takes the responsibility for safe and efficient operation of the mixture and boost controls out of the hands of the pilot) was a feature of the exhibit of H. M. Hobson, Ltd.

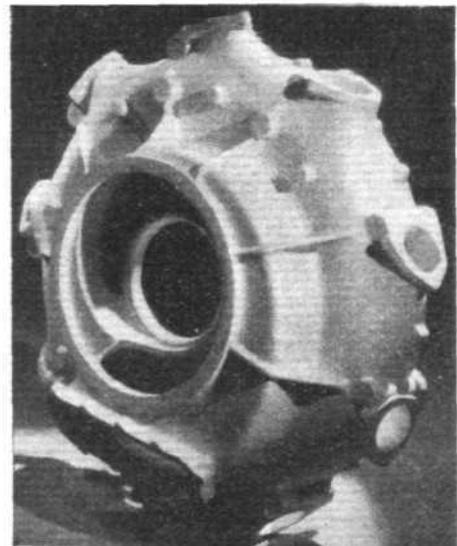
Other items of this stand included aircraft carburetters of many different types, examples of individual controls, a compressed-air-operated fuel pump, and depression gauges.

Metals and Castings

THE very high yet ever-increasing quality and variety of British constructional metals were clearly evident at the S.B.A.C. Show.

Aircraft parts manufactured from stainless steel were to be found on the stand of Accles and Pollock, Ltd. There were samples of steel tubing including those suitable for axles and components of shock-absorbers, spar sections and such items as the arm of a gun mounting, fire extinguisher bottle and water, oil, petrol and exhaust pipes.

Outstanding among the castings shown by the Birmingham Aluminium Casting (1903) Co., Ltd., was the remarkable piece of workmanship illustrated in *Flight* of a cylinder and crank case casting for the Napier "Culverin," measuring 45in. x 42in., 18in., and weighing 525lb.



Casting in aluminium of volute casing made for the Bristol Company by Sterling Metals Ltd.

Aluminium alloy castings included examples of crankcases, gearcases, induction rings and other parts as supplied to many leading engine manufacturers, while there were numerous examples of smaller parts, both for engines and airframe components, in die-cast aluminium. There was also a wide selection of Elektron engine and component castings.

One of the best-known magnesium alloys is Elektron, in various specifications, such as sheet AM 503, which was to be seen on the stand of James Booth and Co. in the form of cowlings and fairings, which were lent them for display

purposes by the De Havilland Aircraft Company.

There were also samples of AZM bars and tubes, another form of Elektron which is widely used by Rumbolds for the manufacture of cabin furniture. Yet another form is AZ 855, from which forgings of airscrew blades have been made for the Bristol Aeroplane Company. Duralumin in all its forms was also shown on this stand.

Aircraft steels in the form of precision-ground round and hexagon bars were to be found on the stand of the English Steel Corporation, Ltd., though this company's exhibit consisted mainly of finished engine components. There were examples of drop forged crankshafts for Napier, Bristol and De Havilland engines (an E.S.C. crankshaft was used in the race-winning "Comet"); gears, drop-forged airscrew shafts, hubs, flanges and bosses; cylinder barrels; connecting rods; and airscrews.

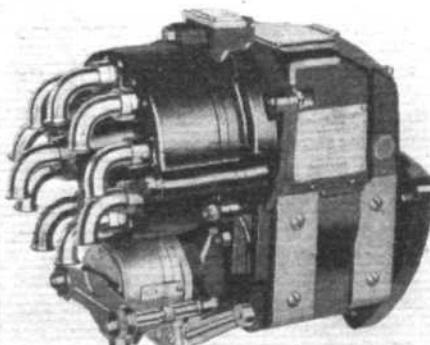
Thos. Firth and John Brown, Ltd., showed the application of their special steels to various parts of leading aero engines, and examples were shown of their range of specialised engineering tools.

Firth-Vickers Stainless Steels, Ltd., exhibited the full range of their famous "Staybrite" and other rustless steels, and showed examples of their application in aircraft work.

Although the stand upon which the steels manufactured by W. T. Flather, Ltd., were shown was only a small one, the importance of this class of material cannot be over-estimated. "Ubas" is one of the best known of the higher grade steels and is the forerunner of the present 2S14 specification. The exhibit also included a selection of components for aero engine and general aircraft construction, machined from steels of various specifications.

Two pillars in D.T.D. 166A material with a mirror-like finish framed the Habershon exhibits. These, in the main, were specimens of steel strip and examples of its application to aircraft construction. Also on the Habershon stand was a product of William Gallimore and Sons, Ltd., "Newloy," an alloy which is white in appearance and indistinguishable from steel.

Parts, such as cylinder heads, barrels,



Rotax-Wattford aircraft magneto.

pistons, connecting rods and crankcases were exhibited by High Duty Alloys as typical of the application of Hiduminium alloys to the engines of a number of well-known manufacturers.

Stampings for the hubs and blades of the Hamilton V.P. airscrews now being made by De Havillands were also shown, while one out-of-the-ordinary exhibit

consisted of two R.R.56 Hiduminium blades which, as a result of a crash from 6,000ft., had bent through approximately ninety degrees without fracturing.

Magnesium castings and stampings were also shown; these were from magnesium alloys produced by High Duty Alloys Associate Company, Magnesium Castings and Products, Ltd.

The Reynolds Tube Co., whose works are at Birmingham, specialise in, as their name indicates, all kinds of tubes. On their stand were to be found examples of the many kinds of seamless steel tubing, both of round and special section, which are used in aircraft construction. Particularly interesting were the taper-gauge and bent axle tubes in nickel chrome steel, and tubular parts for aero engines. This firm also specialises in extruded sections, and there was a large selection of these in Hiduminium R.R.56 aluminium alloy.

Sterling Metals, Ltd., of Coventry, showed Elektron sand and die castings and aluminium sand and die castings, as supplied to a large number of constructors, both for engine and airframe work.

A selection of items in Elektron, which is the lightest commercial metal produced for constructional purposes, were to be seen on the stand of J. Stone and Co., Ltd. These included landing wheels and brake shoes. There were cylinder head castings in Ceralumin, a new aluminium alloy, and tappet guides in chill cast bronze. Examples of machine parts, bearing metals, variable speed gears, rivets and washers were also to be seen.

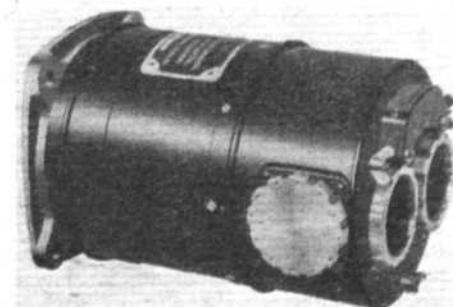
Armstrong-Whitworth showed a range of samples of rolled sections of interest to aircraft constructors.

Electrical Equipment

MODERN aeroplanes demand a surprisingly wide range of electrical accessories, and the firms concerned have answered the call well, displaying amazing ingenuity in the design of some of the smaller items and in the reduction of weight.

Various types of magnetos and starting equipment formed the major part of the British Thomson-Houston exhibit. Different types of rotating-armature magnetos for light aero engines and two other types for larger power plants—the polar inductor pattern and the rotating magnet variety—were shown.

Included among the starting equipment were hand starter magnetos, impulse starters fitted direct to magnetos, a motor starting equipment with trembler coil and switch, inertia starters with switches, and air compression starters. One particularly interesting exhibit was



A Rotax engine-driven generator.



A K.L.G. plug fitted with the maker's new radio screening terminal.

a half-engine-speed magneto arranged to be driven direct from the camshaft, thus eliminating all gearing. This type, it is stated, gives exceptionally low-speed sparking for easy starting. Automatic ignition timing devices, permitting the elimination of all hand controls, were also on view.

The contribution of Callender's Cable and Construction Co., Ltd., was a range of single- and multi-core electric cables and flexibles for general aircraft use and ignition flexible for employment in aero engines.

The samples on view included various types of waterproof and special finishes necessitated by the varying conditions under which these cables are installed. Types of cables manufactured for the R.A.F. and the India Office were shown, together with special varieties supplied exclusively to Imperial Airways.

Accumulators for Aircraft

The popularity of the "Dagenite" accumulators produced specially for aircraft use by Peto and Radford may be gauged from the fact that they were used on eight of the thirteen British starters in the MacRobertson Race. One important factor contributing to the success of these accumulators (they have been consistently supplied to the R.A.F. for the last nineteen years) is the Davis unsplittable vent.

A wide series of six- and twelve-volt accumulators, together with various plate groups and sectional batteries, comprised the Peto and Radford exhibit. They are suitable for supplying current for navigation, instrument and landing lights and electrical engine starters of the inertia and direct-geared types. Those intended for use in civil aircraft have thicker plates and are of more robust construction than those designed for Service use.

Up-to-date types of K.L.G. sparking plugs to meet the varying requirements of all types of aero engines were to be found on the stand of Smith Aircraft Instruments. A feature which attracted particular interest was the new radio-screening terminal illustrated on this page.

A full range of aircraft plugs, including the new Lodge radio-screening types, were in the exhibit of Lodge Plugs, Ltd. The products of this company are supplied, of course, to British and foreign Governments, aero engine manufacturers and commercial air lines throughout the

FLIGHT.

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world. Perhaps the greatest attraction on the stand was the new "short projection" radio-screening plug in its very latest form.

One of the most interesting of the Rotax exhibits, which included Watford magnetos, generators, starters, switchboards and switches, lamps, batteries, junction and fuse boxes, an "Aero" type drill and kindred accessories, was the Y150 direct-cranking electric starter for engines up to 450 cu. in. capacity. It consists of an electric motor which drives reduction gearing operating automatic meshing and de-meshing mechanism from an adjustable torque overload release, and is operated from a 12-volt battery.

The AT 178 Air Ministry pattern 12-volt 500-watt engine-driven generator, which is now being offered for civil use by permission of the Air Ministry, was also there. A special regulating system embodied in this generator gives a substantially constant output over a speed range of 4,000-6,000 r.p.m. An outer cooling jacket through which air is fed by pipes from the slipstream is provided.



The Lodge screening terminal; the very latest pattern is being slightly modified from that shown.

Landing Gear

THE advent of the retractable undercarriage taxed the brain of the specialist to a far greater extent than hitherto, but excellent results were attained. Landing gear of more or less normal type, however, is still fitted to the majority of British aeroplanes, military types at least, and these are continually being improved in detail—strength is being increased, drag reduced, and new braking systems are appearing.

Dowty shock-absorber struts for undercarriages have now become standard on very many aeroplanes, both in this country and throughout the world, and Aircraft Components, Ltd., whose Managing Director is Mr. G. H. Dowty, were showing on their stand their latest retracting undercarriage and retracting tail wheel. The undercarriage, which is operated hydraulically by a power motor with auxiliary hand control, is in three forms and can be retracted forward, rearward or sideways. The same hydraulic system can also be used for operating wing flaps. Electrical indicators are provided and the power motor is automatically switched off when the undercarriage reaches the end of its travel.

On the Dunlop stand the most interesting exhibit was the new "Ecta" tail wheel. The tyre of this wheel is made of a new type of rubber compound which will conduct electricity, and therefore provide an earthing point for an aeroplane when it reaches the ground. This

obviates the possibility of serious shocks or sparks occurring due to the high voltage of the static charge induced during flight.

Apart from this interesting new development, the exhibit included a very full range of aeroplane tyres and wheels of the high-pressure, low-pressure, and intermediate types, as well as those which consist virtually of a hub surrounded by a very large tyre.

Dunlop pneumatic and hydraulic wheel brakes formed other distinctive parts of the exhibit.

The Lockheed Hydraulic Brake Co. had an interesting range of hydraulically operated equipment on their stand. There was an hydraulic jack for undercarriage operation and another for wing flap operation. Then there was the hydraulic equipment for operating the wing root fitting pins for aircraft with folding wings; this, readers may remember, was illustrated in the description of the Blackburn "Shark" in *Flight* of December 13, 1934.

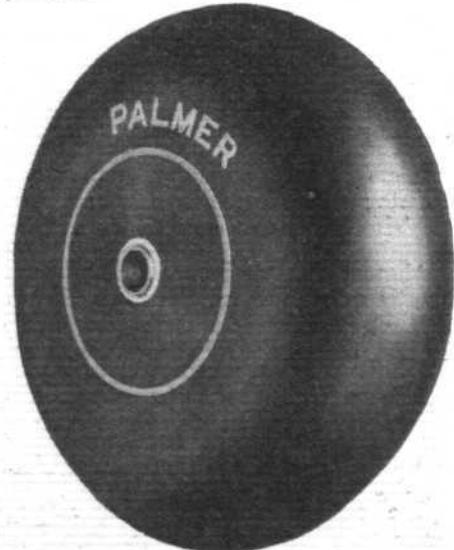
Equally interesting was a form of hydraulic remote control by which engine controls and petrol cocks can be operated. Apart from this there were several items of pipe-line equipment used in connection with the hydraulic jacks, etc. The hydraulic jack unit for undercarriage operation was also shown, fed by both a hand pump and an engine-driven pump. Quite a large amount of this equipment is already used in the Royal Air Force.

A selection of Palmer high-pressure wheels, including the new Monodisk and streamline Monodisk wheel, and a selection of medium pressure aeroplane wheels was exhibited by the Palmer Tyre, Limited.

This company also showed a new streamline tail wheel, the cover of which was made of a new form of rubber which will instantly discharge any static potential from an aeroplane on landing.

The remaining space on their stand was taken up with the various forms of their pneumatic and hydraulic wheel brakes.

Vickers (Aviation), Ltd., in their comprehensive exhibit, showed a new type of oleo-pneumatic shock-absorber strut which, incidentally, is fitted to the Vickers-Supermarine "Seagull" amphibian.



This Palmer streamline tail wheel is made of electrically-conductive rubber.

Radio

SOME form of radio apparatus has now become absolutely essential on all aircraft intended for air-line work and for taxi or charter trips; even machines for the private-owner market have in some cases radio apparatus as part of their standard equipment.

Three stands comprised the radio section of the exhibition. Taking them in alphabetical order, we first came to that of Marconi's Wireless Telegraph Co., Ltd., on which was found medium- and short-wave equipment such as the A.D. 37/38. This is suitable for both commercial and Service operators requiring an equipment which can be used on telegraphy or telephony on wavelengths between 40 and 80 metres and 500 and 1,000 metres. Then there was the larger medium-wave aircraft equipment, the A.D. 41/42, intended for commercial aircraft which have to operate on the wavelength band between 826 and 932 metres. The set is arranged for both transmission and reception on telegraphy by C.W. and I.C.W., and also for telephony, the total span of wavelength over which it can operate being from 500 to 1,000 metres. A range between the aircraft and a ground station of up to 500 miles can be expected from this set.

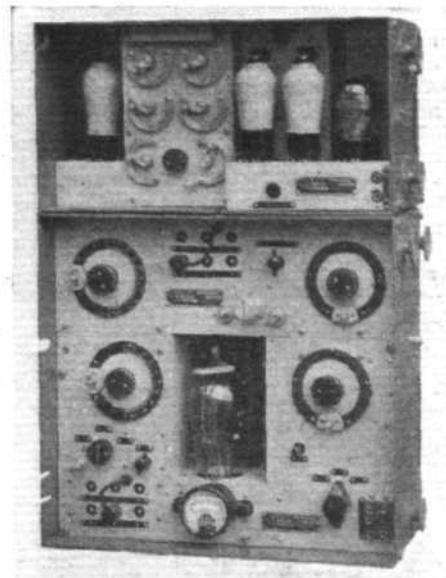
There were also smaller sets designed for use on a fighter aircraft working on the short waves, and sets on the higher waves for the smaller private and commercial aircraft. Designed primarily for privately owned aircraft, there was a small economical receiver for reception of weather broadcasts.

Commercial operators will be interested in the direction-finding equipment, the A.D.52, which incorporates a "homing" system which may be used in conjunction with the majority of Marconi medium-wave aircraft receivers. Either a fixed or rotatable loop aerial can be used with this set.

A range of receivers suitable for ground use were also shown, as were the various kinds of generators and subsidiary equipment, such as winches, switchboards, keys, etc.

Radio Transmission Equipment, Ltd., showed their medium-power equipment, the A.C.44, which is designed for both civil and military use, providing telegraphic or telephonic communication on medium waves; a special form of remote control is one of the most interesting features of this equipment. Another set from this firm, the A.C.57, is designed for short-wave-length transmission and reception and is primarily intended for high-speed military aircraft. Their R.C.34B is a combined aircraft receiver and homing device of the type which has recently been standardised by General Aircraft, Ltd., on their Monospar S.T.25. By means of this the pilot has, through a visual indicator, the power to steer a course directly to any radio transmitting station which is operating between 250 and 1,250 metres.

Standard Telephones and Cables, Ltd., was the third firm exhibiting radio equipment. Their T.S.4 is a combined long- and short-wave aerodrome transmitter with a power of 80 to 200 watts according to whether telephonic or C.W. telegraphic is used. The ranges covered are 40 to 80, and 500 to 1,000 metres. An equipment of this type has been installed at the Bristol Airport. The same firm



Marconi A.D. 43/44 20-Watt intermediate-wave wireless equipment, designed for fighter and similar types of aircraft using telegraphy or telephony.

also showed their A.T.R.14, primarily designed for civil aircraft, providing for telephonic or telegraphic communication on five fixed wavelengths between 500 and 1,000 metres.

The final item of their exhibit was a new form of direction-finding receiver, which can be used as a "homing" device or for taking exact bearings on any transmitting station. A visual indicator was included.

Instruments and Cameras

A LEADING position in the production of aircraft instruments, particularly the very highly sensitive kinds, is held by this country, and great foreign interest was apparent at the stands of instrument makers.

Compasses on the stand of Kelvin, Bottomley and Baird, Ltd., were the K.B.B. Types 3 and 4, a landing compass (used for the adjustment of aircraft compasses and for setting out bearings), and a range of Service models. A petrol level gauge exhibited was a development of the company's tank gauges manufactured since 1919. The special adaptation to aircraft tanks involves a very light balance chamber placed in the tank connected by tubing to the indicating gauge. By means of a small hand air pump situated at the gauge a small quantity of air is passed down the tube from the gauge to the balance chamber in the tank, so that the imprisoned air is at a pressure corresponding to the head of liquid above the balance chamber orifice.

The company showed also a sample of the Mutochrome Screen used for signalling purposes with an Aldis lamp, a Pneumarcator gauge for very large tanks, a Vibrometer of the tuned reed type and etched and waxed metal dials.

The P.B. automatic three-axes control for aircraft was very fully dealt with in *Flight* of March 14, 1935, so a detailed description is unnecessary here. One of these controls was exhibited on the stand of P.B. Deviator, Ltd. Mr. Pollock Brown, the designer, had flown to Hendon on the morning of the Display in a "Dragor" equipped with one of his controls, and his enthusiasm was ob-

viously no idle "sales talk." The apparatus is surprisingly simple and compact, and the weight of a complete installation for control on three axes is under 60 lb.

Certainly one of the most interesting stands was that of Smith Aircraft Instruments. On this there was a display of "Husun" aperiodic compasses, navigation instruments (under which heading might be included course and wind calculators, bomb sights, sextants and slide rules), a rate of climb indicator, turn and bank indicator, the "Frazer Nash" wing tip flare device, Smith-Harley landing lamp, portable testing apparatus, and a variety of other instruments of familiar type.

The famous Eagle cameras and new types of camera guns attracted a steady stream of callers to the stand of the Williamson Manufacturing Co., Ltd. Two types of Eagle cameras were to be found, the Series III, which takes a picture measuring 5in. by 5in., and can be used without modification with or without instrument records, and the Series IV and 18 by 24 cm. camera.

The Williamson camera gun is the very latest "weapon" of its type which has been produced for training in aerial gunnery. It is designed in two forms, for use by a pilot and observer respectively. Rapid daylight developing enables the results of a mock combat to be assessed while the exploit is fresh in the minds of the "combatants." The photograph records the position of the aircraft on a target at the moment the first shot is fired. In addition, a photograph of a watch showing the duration of the "burst" is obtained. Standard 2½in. film is used and the telephoto lens of 12in. focal length is used in conjunction with the Williamson patent louvre shutter.

Short and Mason, Ltd., displayed the following comprehensive exhibit of instruments:—Avro 626 instrument panel, B.A. "Swallow" instrument panel, altimeters, altigraphs, air speed indicators, boost gauges, cross levels, "Sestrel" compasses, drift indicators and bearing plate, revolution indicators, "Brown" turn and bank indicators, fuel pressure gauges, fuel depth gauges, oil temperature gauges, oil pressure gauges, radiator thermometers, and meteorological instruments.

Parachutes and Pilot's Equipment

A PARACHUTE is undoubtedly necessary for all forms of military flying, and is also very desirable where pilots are engaged in such duties as carrying mails by day and night in all kinds of weather, and over ground upon which it is impossible to make forced landings.

The G.Q. Parachute Co. exhibited their new "Parasuit" (see page 30), which comprises a service suit with silk harness and parachute incorporated. The folding of this latter is done in a new and interesting manner which results in the pack being no thicker than 1½in. It should be of value for military aircraft, where gunners are incommoded by parachutes which are thicker when packed. An easily cleared quick release was also shown, as was the method whereby the standard G.Q. parachute can be maintained without necessitating its return to the factory.



Unobtrusive—the Irvin chair parachute for cabin aircraft.

Irvin Air Chutes have been used exclusively by the Royal Air Force and over forty other government air forces for a number of years. They are, therefore, well known and do not need detailed description. The makers' exhibit included both the standard types—pilot and observer—and also their compact chair-type, installed in chairs suitable for use in cabin aircraft.

All military operations nowadays demand of machines and pilots the ability to fly at high altitudes.

One of the chief difficulties in this connection is the provision of oxygen to enable the pilots to live.

Siebe Gorman and Co. specialise in the production of oxygen breathing apparatus and complete oxygen installation.

All forms of this were shown at their stand.

Electrically heated clothing, another vital necessity for high altitude flying, owing to the low temperatures experienced was also there for people to see.

On the same stand were calibrators for instruments like altimeters and air speed indicators, pneumatic brakes and containers for dropping supplies.

Fuel and Lubricants

THERE was evidence of very definite advances made in the production of lubricants

Samples illustrating the range of oils and greases available for aviation purposes manufactured by Shell-Mex and B.P., Ltd., comprised the exhibit of that company.

A lighted cascade of Speedolene aero oil contained in a cabinet on the stand of Silvertown Lubricants, Ltd., added a bright touch, a light, shining from beneath the oil stream, indicated in excellent fashion the clarity of the oil.

The Wakefield company's new patent Castrol was exhibited for the first time to the aviation industry. Although production on a commercial scale began only last December, these patent oils, it is stated, are longer matured than their introduction date—the end of March—

would suggest. Actually, the first supplies were made to the Hayes works eighteen months ago. Last spring Sir Alan Cobham changed to the new oil, and his fleet flew a quarter of a million miles on patent Castrol. According to Sir Alan, the engineers, who were unaware of the fact that patent Castrol was being used, were continually remarking on the clean oil filters.

Dopes, Varnishes and Paints

THE days when effectiveness of aircraft finishes was incompatible with attractiveness are past. Some of the finishes displayed by our manufacturers of dopes, lacquers and paints were certainly comparable with those to be found on the better types of American aeroplanes, which have acquired a name for smartness.

Examples of Cellon doping schemes "X," "V" and "Z" were shown by Cellon, Ltd., on fabric, wood and metal. Incidentally, the last-named scheme is one which gives a similar finish to that found on certain "luxury" American machines. There were "Cerrux" synthetic finishes for various metals, the

salt water, the container being sealed by a Birmingham City Councillor. In addition there were small sections of various aircraft in duralumin, steel and wood, finished with Zilak cellulose, Ardk, synthetic finish, Ryland varnish and enamel, Ryland stoving enamel, and other of the company's products. Tubes and test pieces were also coated with each of these materials, and the company showed a collection of photographs of machines finished with these products.

On the stand of Nobel Chemical Finishes, Ltd., were fabric panels illustrating the firm's standard doping schemes and specimens of fabric treated with their aluminium satin finish. Plain and fabric-covered plywood, displaying both cellulose and synthetic finishes, was also to be seen. The "Dulux" synthetic air-drying finish, which conforms to A.M. Specification D.T.D. 52a, was demonstrated on panels of duralumin and steel, and there was a stand showing the recommended finishing systems for various alloys. Dope-resisting white paint was shown, and an interesting display of the results achieved with A.C.P. Deoxidine and Peroline for the protection of metal was given. Kenwick heat-resisting paint was also on view. Finally, there were specimens of magnesium alloy impregnated with Synthetic Impregnating Varnish N.X. 5555, in order to seal the porosity of this alloy, and other specimens of Nobel glossy and matt crystallising enamel.

Protection Schemes

Examples of the application of Titanine Dopes and Finishing Varnishes for fabric and plywood in the form of aeroplane wings and fabric and plywood panels constituted the exhibit of Titanine Emaillite, Ltd. In addition, spars and other metal parts were shown, these being coated with Titanine synthetic lacquers to illustrate the firm's schemes of metal protection.

Other exhibits were examples of the standard Silver and Nivo finishes employed on Service aircraft (Air Ministry approved Titanine Doping Schemes T.2.S., T.4.S and T.5.S.), and a special feature was made of the Titanine "Satin Finish." This last, which gives a particularly smooth and glossy finish, is obtainable in a variety of colours: examples of its application to fabric and plywood were on view.

There was a model (finished in the same scheme as the actual machine) of the Comet which won the England-Australia Race, and the coating of the entire stand was in Titanine materials of various kinds.

Aerodrome Lighting

KEEPING pace with the growth of commercial aviation in Britain, aerodrome equipment has made immense strides during the last two or three years.

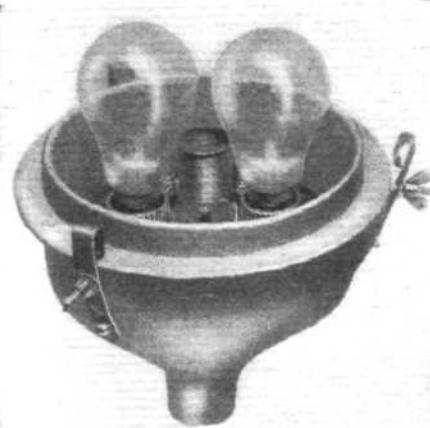
This is particularly true of lighting equipment, and some highly interesting and up-to-date systems of this kind were to be found on the stand of Chance Brothers and Co., Ltd. There were two of the company's standard boundary lights (these embody an amber light which surmounts an illuminated pillar giving a soft opal light from two lamps,



Irvin parachute equipment of the Service pilot type.

process employed for each being shown. Some highly attractive crystalline finishes for dashboards were noted. The exhibit was completed by "Cerrex" anti-corrosive undercoats for use on all metals subject to corrosion (especially magnesium alloys), doped fabric and metal panels treated with "Suedee" finish to give a decorative and anti-resonant effect, and actual examples of weathering tests on "Cerrux" synthetic lacquers.

The whole colour scheme of the stand of Llewellyn Ryland, Ltd., was in black and aluminium, the front and back being finished with black Ryland enamel and the table top—a sheet of duralumin—with aluminium Ryland, both to specification D.T.D.62A. There was continuous interest shown in a wooden panel finished with Ryland varnish, which was immersed four years ago in



The Chance Brothers' obstruction light has two lamps; should one fail the other is switched on by a solenoid.

each of 6.6 volts and 6.6 amperes) and an obstruction light which is automatic in operation and is fitted with two lamps, one of which is normally illuminated. In series with this lamp is the winding of a small solenoid, which energises the solenoid when the first lamp is illuminated. When the solenoid becomes energised the circuit to the "stand-by" lamp is opened. Thus, if the first lamp burns out, the current ceases to flow in the solenoid winding, allowing the solenoid guard to drop and establish the circuit to the "stand-by" lamp.

Also on this stand were to be seen sundry examples of glassware associated with aviation lighting, and sample colour tints.

Miscellaneous Components and Accessories

THE continued increase in aircraft performance calls for a corresponding increase in the efficiency of components and accessories, and the high level reached by British manufacturers of these items was clearly evident at the Show. The following notes describe various components and accessories not dealt with under individual headings.

The stand of the Blackburn Aeroplane and Motor Co. had a very varied selection of the products of this North-Country firm. For example, there was a complete set of the operating and holding mechanism for a torpedo, and a pilot's seat, both from one of our latest Torpedo Spotter Reconnaissance machines, the Blackburn "Shark." There was also a model of this actual machine, as well as of a B.2 trainer, the first Blackburn aeroplane, the H.S.T.10—a new commercial monoplane which is coming out shortly—and the "Bluebird IV." There was, too, a fuel tank in aluminium from one of the large "Iris" flying boats and a wide range of photographs of other machines, as well as of the factory.

As in previous years, the Brooke Tool Manufacturing Co. showed a section of structural fittings machined from bar and forgings. A wide range of production tools was also exhibited, and included high-production milling cutters of all types, reamers, twist drills, gear cutters and hobs, inserted blade facing heads, the Brooke patent drill chucks for hand or key operation, high-speed steel metal slitting saws, including the special side-chip clearance type, and

taper pin reamers. Cardinal patent side and face milling cutters and a range of special counter-bores with interchangeable pilots was shown for the first time.

Brown Bros., Ltd., on stand No. 56, showed an extremely wide range of the smaller parts which are used in such numbers in the construction of aeroplanes. It would be impossible to catalogue every single item, but to give some idea it may be said that there were bolts, nuts, fork joints, turnbuckles, tie rods, fuel system fittings, filters, strainers, ignition cables, parts for bonding and screening, fabric and tapes, and specimens of steel which could be supplied as material direct to the manufacturer. Furthermore, all the small A.G.S. parts were exhibited in steel, duralumin, phosphor bronze, and other materials.

The Exactor Control Company, Ltd., showed a sectional model of their hydraulic remote control system invented by Dr. Hele-Shaw and Mr. Beacham. The method by which exact reproduction and synchronisation have been obtained was demonstrated.

A set of engine controls suitable for twin-engined aircraft are also shown. Two throttle and two mixture controls are inter-coupled in such a way that it is not possible to obtain weak mixture with full power. This automatic safety device moves the mixture control to its rich setting whenever the throttle is fully open. This work has been done with acknowledgments to H. M. Hobson, Ltd.

All-metal airscrews, some with fixed and some with adjustable blades, both types being of light alloy, were shown on the stand of the Fairey Aviation Co. There was also one of their very interesting gun mountings, which is so widely used in military aircraft, and which enables the rear gunner to "ply his trade" while shielded from the slip stream.

Rotherham and Sons, Ltd., showed a very wide range of their well-known detail fittings, which are mainly in the province of pipe-work, and cover almost every conceivable kind of union, tap, adaptor, filler cap, etc. Another accessory was the Rotherham mechanical air pump for aircraft, which is simple and light in construction, and gives an adjustable pressure range of from 1 to 10 lb./sq. in.

A very interesting example of modern flying-boat construction was to be found on the stand of Short Bros., where a wing-tip float for one of their "Singapore III" flying boats was exhibited.



A new Vickers accessory—the portable lifting-jib, which can also be used in conjunction with the Vickers bent-beam aero engine lifting tackle.

Safety glass has now become a *sine qua non* for the windows of cabin aircraft. It can be of various forms, and that made by the Triplex Safety Glass Co. has been used for a great number of years.

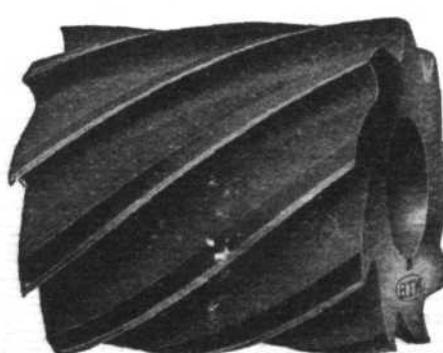
Apart from cabin windows, goggles and windscreens, which will not shatter when hit by bullets or pieces of flying metal, are also of great value from a military point of view.

Another interesting item on this stand consisted of panels of glass wired for electrical heating to combat ice formation at high altitudes.

Several different kinds of controls suitable for use in aircraft were exhibited by Simmonds Aerocessories, Ltd. Their Simmonds-Corsey type has already been very fully described in *Flight*, and is widely used for a number of purposes both in military and commercial aircraft.

The new Simmonds roller control has recently been introduced, and should prove of great value where heavy loads have to be transmitted.

Other items handled by this company include various forms of cowling clips, suitable both for cowling (like that which normally surrounds engines and, in some cases, undercarriages), and also for doors, such as those of luggage



Examples of milling cutters produced by the Brooke Tool Manufacturing Co.

The S.B.A.C "Static" Display—

lockers. All were to be seen on this stand.

An automatic nibbling machine and examples of the work which it can do were to be seen on the stand of J. B. Stone and Co., Ltd. Fast cutting in any direction and quick setting are claimed to be great advantages of these machines, which are employed by no

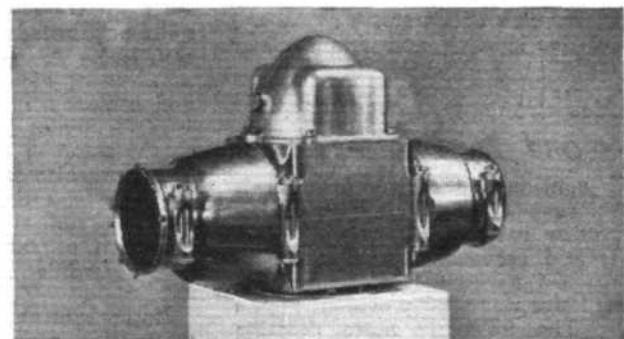
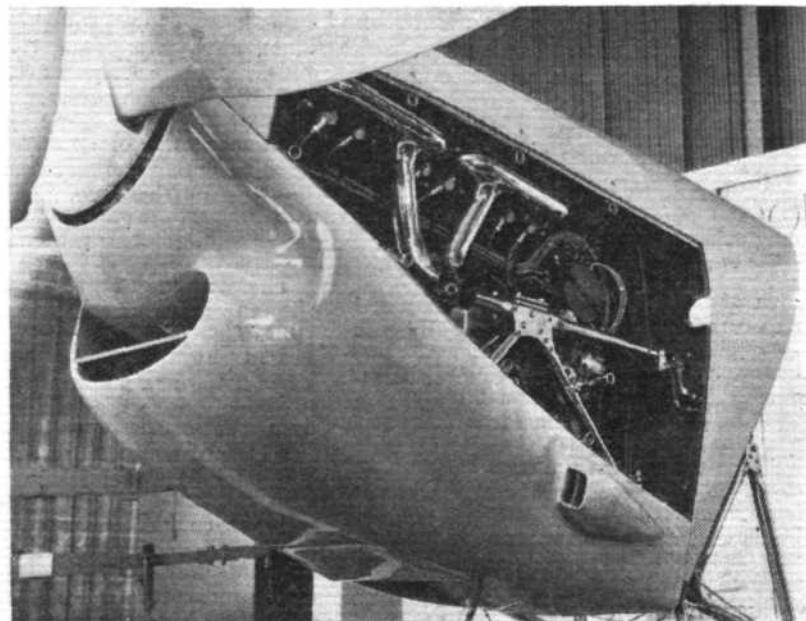
fewer than eleven well-known British aircraft manufacturing firms.

Perhaps it should be explained that a nibbling machine cuts all kinds of shapes from sheet metal; it embodies a rapidly moving circular punch operating over a circular die, and a small "bite" is taken with each stroke of the punch.

Vickers (Aviation), Ltd., is a firm with a very wide range of products which can

be styled as aircraft components quite apart from its well-known aircraft, and on this stand were exhibited many items which are normally included in the fuel, oil and water systems of aeroplanes and flying boats.

Another interesting item was the Vickers bent-beam lifting gear for engines, which was demonstrated on a Vickers portable tubular lifting jib.



A GROUP OF "STATIC" EXHIBITS. (Top left) The G.Q. "Parasuit" combines a Service suit with a parachute; (Top right) The Rolls-Royce "Kestrel VI" has a new cowling and exhaust system. (Bottom left) A D.H. "Gipsy Six" was shown mounted in a cut-away nacelle. (Bottom right) The Fairey V.P. airscrew hub is mechanically controlled over a pitch range of about 20 degrees. (Flight photograph.)

Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in the list.

- July 6. Royal Air Force Fly-past before H.M. the King at Duxford.
- July 7. Douze Heures D'Angers, Aero Club de France.
- July 13. Opening of Leicester Municipal Airport.
- July 20. Opening of Brighton, Hove and Worthing Municipal Airport, Shoreham.
- July 20-21. Coupe Armand Esders, Aero Club de France.
- July 26. Opening of Newcastle-upon-Tyne Municipal Airport.
- July 27. London-Newcastle Race, Newcastle Aero Club.
- July 28. Private Owners' Garden Party, Ratcliffe, Leicester.
- Aug. 10-20. Second International Austrian Alpine Flight.

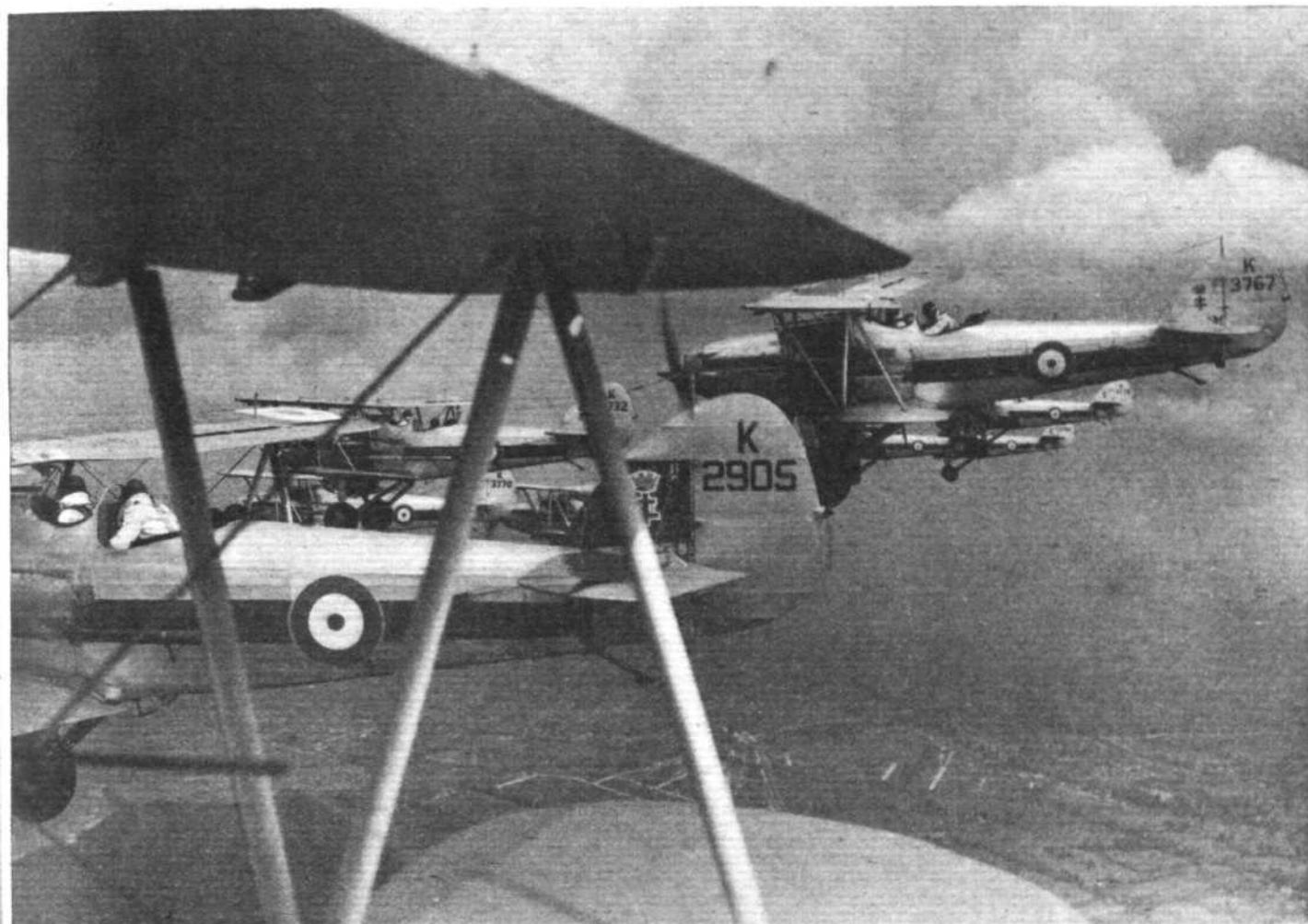
- Aug. 17. Round the Isle of Wight Air Race and Portsmouth Air Trophy.
- Aug. 24-25. Third International Flying Meeting, Lympne.
- Aug. 24-Sept. 1. National Gliding Competition, Sutton Bank.
- Aug. 24-25. Cinque Ports Club. International Flying Meeting and Wakefield Cup Race.
- Aug. 24-30. Raduno del Littorio, Rome. Reale Aero Club d'Italia.
- Sept. 4-18. Jungfraujoch Concours, Aero Club de Suisse.
- Sept. 6-7. King's Cup Air Race.
- Sept. 14. Cinque Ports Club. Folkestone Aero Trophy Race.
- Sept. 15. Gordon Bennett Balloon Race, Warsaw.
- Oct. 12-28. International Aircraft Exhibition, Milan.

THE ROYAL AIR FORCE



SERVICE NOTES AND NEWS

AIR MINISTRY ANNOUNCEMENTS



TWO-SEATER FIGHTERS : A fine close-up aerial photograph of No. 41 (Fighter) Squadron, from Northolt. It is equipped with Hawker "Demons" and the squadron marking is a broad red band.

INSPECTOR-GENERAL APPOINTED

The Air Ministry announces:—

In order to assist the Chief of the Air Staff in the work of supervising the current expansion of the Royal Air Force, the Secretary of State for Air has decided to revive for a limited period the appointment of Inspector-General of the Royal Air Force.

Air Chief Marshal Sir Robert Brooke-Popham, K.C.B., C.M.G., D.S.O. A.F.C., A.D.C., now Air Officer Commanding-in-Chief, Air Defence of Great Britain, has been selected to fill this appointment, which he will assume on August 1, 1935.

Air Chief Marshal Sir Robert Brooke-Popham will be relieved in his present post by Air Marshal Sir John M. Steel, K.C.B., K.B.E., C.M.G., who recently relinquished the command of the Royal Air Force in India.

Air Chief Marshal Sir Robert Brooke-Popham was appointed in 1912 from the Oxford and Bucks Light Infantry to the Air Battalion, Royal Engineers. He then served with the Royal Flying Corps and was in France from August, 1914, with short intervals until the end of the war. He was appointed in command of a Wing in February, 1915, and was subsequently employed on staff duties at Royal Flying Corps Headquarters. After the war he became Director of Research at the Air Ministry until November, 1921,

when he was appointed the first commandant of the then newly constituted Royal Air Force Staff College, which post he held until May, 1926, when he became Air Officer Commanding, Fighting Area. He was appointed Air Officer Commanding Iraq Command, in November, 1928, and Commandant of the Imperial Defence College in January, 1931, when he was promoted to the rank of Air Marshal. Since April, 1933, he has held the appointment of Air Officer Commanding-in-Chief, Air Defence of Great Britain. In December, 1933, he was appointed Principal Air Aide-de-Camp to His Majesty the King, whilst in January, 1935, he was promoted to the rank of Air Chief Marshal.

For his services during the war he was awarded the D.S.O. and the A.F.C. In addition, he was mentioned in despatches on four occasions and had foreign orders bestowed on him. He also received the awards of C.M.G. in January, 1919, C.B. in June, 1919, and K.C.B. in June, 1927.

Air Marshal Sir John Steel was employed on naval duties during the early years of the Great War, being promoted to Captain, Royal Navy, in 1916. From February, 1917, until the end of the war he commanded the air station at Eastchurch. For his war services he received the C.M.G. and the C.B.E., and was also mentioned in despatches.

After the war he became Director of Operations and Intelligence at the Air Ministry, being appointed in addition to be Deputy Chief of the Air Staff in 1922. In the same year he was awarded the C.B. and in the following year was made an additional member of the Air Council. He was promoted Air Vice-Marshal in January,

1925, and assumed command of Wessex Bombing Area, Air Defence of Great Britain, in April, 1926. He was appointed a Knight Commander of the Order of the British Empire in the Birthday Honours List, 1926.

In February, 1931, he was appointed to command the Royal Air Force in India and was promoted to Air Marshal the following year. In the New Year Honours List, 1935, he received the K.C.B.

THE AIR MINISTER'S SECRETARIES

The Air Ministry Announces:—

The Right Hon. Sir Philip Cunliffe-Lister, G.B.E., M.C., M.P., Secretary of State for Air, has appointed Mr. C. J. Galpin, D.S.O., to be his Principal Private Secretary, and Mr. F. H. Sandford to be his Assistant Private Secretary.

CENTRAL MEDICAL ESTABLISHMENT

No. 1 Central Medical Board at 3/4, Clement's Inn, London, W.C.2, will carry out all medical examinations in connection with the Central Medical Establishment, with the exception of those for *ab initio* entries.

No. 2 Central Medical Board at Astor House, Aldwych, London, W.C.2, will carry out all *ab initio* medical examinations, in connection with the Central Medical Establishment.

CIVILIAN MESS WAITERS' UNIFORM

It has been decided that an official issue of uniform will in future be provided for civilian mess waiters employed at R.A.F. establishments and stations.

JOINING THE R.A.F.

Flight constantly receives enquiries as to how to join the R.A.F. Apparently many R.A.F. stations are now bombarded by similar enquiries, and the Air Ministry has issued the following instructions for dealing with them.

For Commissions.—The enquirer should be informed that full particulars will be given on application to the Secretary, Air Ministry, Adastral House, Kingsway, London, W.C.2.

For Enlistment.—(a) *As direct entry airman pilot.*—The enquirer should be informed as above. (b) *In other trades.*—The enquirer should be furnished with a copy of the illustrated booklet "The Royal Air Force—a Life for Men," and referred to the nearest R.A.F. recruiting depot for more detailed information. Supplies of the illustrated booklet should be obtained from the Air Ministry Publications Depot. The following recruiting depots have been established and the addresses of others will be notified in Air Ministry Orders shortly:—London, Victory House, Kingsway, W.C.2; Birmingham, 55, Cornwall Street; Glasgow, 10, Bothwell Street; Liverpool, 79, Lime Street; Belfast, 46, Ann Street.

ROYAL AIR FORCE GAZETTE

London Gazette, June 25, 1935

General Duties Branch

The following are granted short service commissions as Acting Pilot Officers on probation, with effect from and with seniority of June 12:—M. P. Casano, E. C. Eaton, D. E. C. Evres, J. A. Field, J. H. L. Graham, M. W. Hamlyn, R. W. Hase, J. R. Henderson, F. C. Hopcroft, R. W. G. Kitley, L. Maxwell-Muller, G. M. Roddy, W. Simpson, C. B. B. Wallis, P. White.

Lieutenant J. B. Buckley, R.N., is reattached to the Royal Air Force as a Flight Lieutenant, with effect from May 27 and with seniority of Jan. 1, 1934; Pilot Officer on probation C. G. R. Lewis is confirmed in rank (April 30); Flying Officer I. O'B. Macgregor (Capt., R.A.) (Hon. Flight Lt.) is promoted to the rank of Flight Lieutenant (April 1); Flying Officer H. R. Dale is promoted to the rank of Flight Lieutenant (May 22); Pilot Officer R. P. H. Carew is promoted to the rank of Flying Officer (May 12).

The short service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty on the dates stated:—P. I. Hoyle (June 22); B. L. Powell (June 24).

Accountant Branch

The following are granted permanent commissions as Pilot Officers on probation, with effect from and with seniority of June 12:—H. C. Fleming, R. O. Heath, F. H. Shutt.

Pilot Officer on probation W. N. Hibbert is confirmed in rank and promoted to the rank of Flying Officer (June 9); Flying Officer T. C. Keep is promoted to the rank of Flight Lieutenant (June 11).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

R. H. B. Grattan is granted a Commission as Flying Officer in class C on resigning his commission in the Special Reserve (May 24).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders.—L. O. Brown, D.S.C., A.F.C., to No. 22 Group Headquarters, S. Farnborough, 19.6.35; for Air Staff duties vice Wing Cdr. A. W. F. Glenny, M.C., D.F.C. F. Wright, to R.A.F. Station, Manston, 19.6.35; for Administrative duties vice Sqn. Ldr. D. O. Mulholland, A.F.C.

Flight Lieutenants.—F. J. St. G. Braithwaite, to Anti-Aircraft

R.A.F. EXPANSION

Sir Philip Cunliffe-Lister, Secretary for Air, speaking at Alloa Park, Clackmannanshire, on Saturday, June 22, said that unless they made the Air Force adequate they would not have the faintest chance of getting either an air pact or limitation of armaments. The expansion of the Air Force, he said, was not a panic measure, but was being undertaken because peace demanded it. Expansion was required if they were to achieve the two things which he would do all he could to secure. One was a pact of security in the air and the other the limitation of air armaments.

SQUADRONS REFORMING

In the issue of *Flight* of April 11 last, the numbers and stations of eleven squadrons, which are to be re-formed, were given. Some alterations have now been made in the list of aerodromes where these squadrons will be stationed. Three were put down for Upavon, a station under the administration of the Coastal Area. Upavon has now been cut out of the list, and No. 21 (Bomber) Squadron will be at Catterick, and Nos. 34 and 83 (Bomber) Squadrons at Aldergrove, in Co. Antrim, which now only accommodates the Ulster Cadre Squadron of heavy bombers. No. 46 (Fighter) Squadron will not be at Henlow, which is not regarded as a station for squadrons, but at Kenley. No. 97 (Bomber) Squadron will be not stationed at Mildenhall but at Boscombe Down.

LONG SERVICE AND GOOD CONDUCT MEDAL

The Long Service and Good Conduct Medal has been awarded to the undermentioned airmen:—W.O.2.s Childs, W. F., Cowen, A. V., Lovelock, J., Flt. Sgts. Allen, C. H., Bloye, R. S., Cadman, H., Dunn, A., Girdwood, E. V., Hardwick, A. S., Harris, R., Howarth, J. W., Little, L. A., McGeorge, H. W. T., Payne, J., Reid, H. G. M., Smith, H. M.M., Smith, T., Williams, J. A., Sgts. Bradshaw, H. C., Brereton, G. W., Essam, H., Flint, A., Grigg, F., Lawes, F. W., Longley, J., Newton, R. F., O'Callaghan, M., Smith, F. G., M.M., Smith, R., Webber, E. J., Cpl. Allan, J. D., Blowers, G. A., Deacon, W., Foreman, D. W. H., Gates, E. A., Hewitt, A. E., Hickton, C. J., Jones, J. V., Linegar, L., Newton, A. J., Ormandy, M., Payne, G. L., Perham, T., Riddle, A., Walker, H. W., Wellbeloved, S. W., Wells, C., Cpl. A/Sgt. Wilbraham, J. H., Cpl. Wood, H. G., L.A/C. Snowden, W.

FLYING ACCIDENT

The Air Ministry regrets to announce that P/O. Norman Dorrington Ashton lost his life in an accident which occurred near Selsey Bill on June 27, 1935, to a "Fury" aircraft of No. 43 (Fighter) Squadron, Tangmere. P/O. Ashton was the pilot and sole occupant of the aircraft.

SPECIAL RESERVE

General Duties Branch

Flying Officer R. H. B. Grattan resigns his commission (May 24).

AUXILIARY AIR FORCE

General Duties Branch

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—J. R. Hawkes is granted a commission as Pilot Officer (May 25).

No. 604 (COUNTY OF MIDDLESEX) (FIGHTER) SQUADRON.—Flying Officer M. F. Anderson is promoted to the rank of Flight Lieutenant (June 6).

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—The following are granted commissions as Pilot Officers:—G. C. White (May 29); T. T. Richardson (June 4).

Dental Branch

Flight Lieutenants.—W. D. Guyler, to Home Aircraft Depot, Henlow, 20.6.35. J. E. Willoughby, to Headquarters, Coastal Area, Lee-on-the-Solent, 20.6.35.

COMBATING ICE FORMATION

The Dunlop "Anticer" Demonstrated : A Device Which Prevents the Formation of Ice and Which Does Not Spoil the Shape of the Leading Edge

DURING the past year even the most sceptical of air line operators and pilots have realised the vital need for some means of combating the effects of ice formation on aeroplanes. A few years ago, when instrument flying was not the order of the day, the trouble was met only by a few stalwart charter and meteorological pilots, and a quick change of height would usually solve the problem for the moment.

To-day, however, ice prevention ranks with blind landing as perhaps the most important of the new difficulties which still restrict air transport in its all-the-year-round usefulness. Any attempt to deal with it must be treated as of vital interest.

Those readers who saw the article in *Flight* of February 21 will remember that two primary types of deposit are formed—clear and opaque, the former being the more troublesome. It appears within a comparatively small temperature range under specific conditions of humidity and builds dangerously quickly.

Farnborough Research

For two years research has been carried out at Farnborough by Messrs. B. Lockspeiser and J. E. Ramsbottom with an idea of preventing rather than curing the trouble, and development in its final stages has been taken over by the Dunlop Rubber Company. At the demonstration last Friday, the present installation was proved by film records to be entirely efficacious, but the company hopes that a number of the Anticers, as they are called, will be fitted to air line machines before the difficult season, so that the equipment can be fully tested in actual service.

Briefly, the idea behind the system is to liquefy, by means of ethylene glycol and ethyl alcohol, a very thin layer of ice in actual contact with the leading edges, and to this end the edges are covered with a porous leather through which the liquid is fed. Obviously, in the case of minor accretions, the ice is immediately melted, while faster formations are

loosened and finally blown away. The pilot has complete control of the supply of liquid so that it is, in cases of emergency, possible to flood the edges.

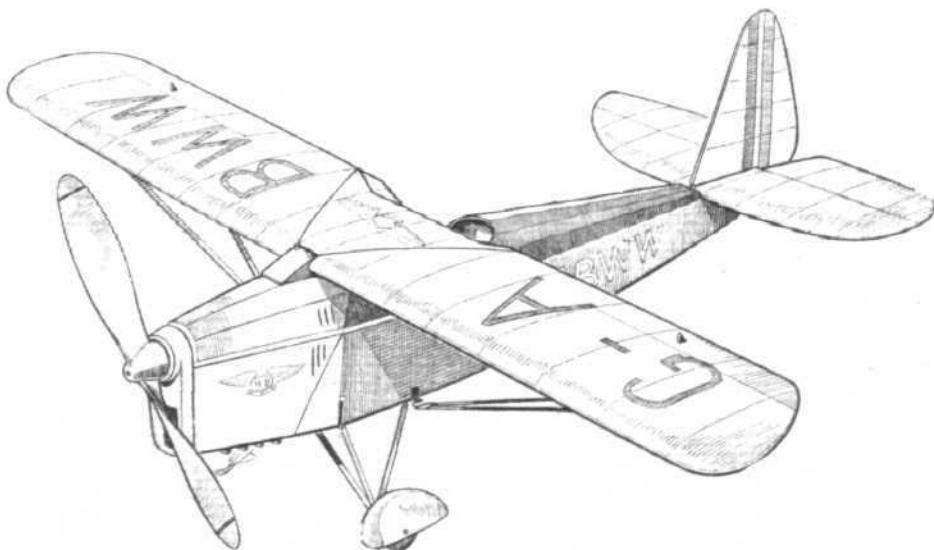
A layer of rubbered fabric is doped to the leading edges of the wings, fin and tail plane with the rubbered surface uppermost and the liquid is forced down a rubber tube, perforated at $\frac{1}{16}$ in. intervals, which is cemented to this surface. These perforations are, in fact, valves, designed so that the supply along the whole edge is perfectly even. A porous cotton fabric layer is used to spread the liquid and to wet the leather outer covering which is in actual contact with the air.

The ethylene glycol mixture is delivered under pressure through a reducing valve by means of an oxygen or compressed air bottle. If no such equipment is carried, a "bottled" supply or a small air pump can be used. In the case of the Dunlop "Leopard Moth," to which the demonstration equipment is fitted, the pressure is supplied by the air bottle used for brake operation, and the air supply is not, of course, appreciably depleted even by consistent use of the Anticer. In addition to the normal pressure gauge, the standard equipment includes a flowmeter of the moving vane type and the normal flow in continuous operation on the wings and tail unit of a Hawker "Hart" was in the region of two pints an hour. The leather, incidentally, remains moist for long periods after application as the liquid, of course, is not volatile. During one test the supply was turned fully on for a short period before entering an ice-forming area and then turned off. For half an hour little ice formed on the treated edges, though it formed on struts to a depth of as much as $3\frac{1}{2}$ inches.

On a normal machine the equipment, including half a gallon of liquid—sufficient for two hours' continuous use—weighs only 30lb., while the nose fitting weighs about $\frac{1}{2}$ lb per foot. The container and liquid, of course, need not be carried for any but winter operations.

It is obvious that, even in the case of a machine on which the Anticer is a subsequent fitting, the device has little effect on the shape of the leading edge.

AWARD for MERIT



The rubber-driven "Comper Swift" model with which Mr. H. G. Lambert won the *Flight* Challenge Trophy (right) at the Northern Heights Model Flying Club's Rally last Sunday. Results were judged both on appearance and performance. The model is of the machine which finished second in the 1932 King's Cup Race, entered by H.R.H. the Prince of Wales and flown by Flt. Lt. E. H. Fielden. Other results at the meeting will be given in the Models Section of *Flight* next week.

COMMERCIAL AVIATION

— AIRLINES ————— AIRPORTS —



THE WESTERN FLEET. Starting operations with a single machine at Filton aerodrome in 1929, Mr. Norman Edgar's fleet now consists of three D.H. "Dragons," two "Puss Moths" and a "Gipsy Moth." Additional and faster machines are to be acquired in due course for service extensions detailed in this issue.

THE WEEK AT CROYDON

For the R.A.F. Display : The Dangers of Diplomatic Air Travel : Saving and Wasting Time : The "Perseus-Scylla" : New Services : Entertaining the Air Ministry

AS the R.A.F. Display date comes nearer air traffic people appear for the most part to quit work and to gravitate from all over Europe towards Hendon *via* Croydon. Directors, managers, chief engineers of firms from half a dozen countries came pouring in on the Friday and Saturday. Judging by the snappy way in which they moved, this invasion appears to act as a temporary tonic to jaded ground staffs.

Quite a number of foreign craft, mostly of Service types, also arrived, including two French, a Dane, an Italian, and the venerable tri-motor Fokker which is used by the Netherlands Royal Air Force as a kind of char-a-banc on these occasions. It disgorged a number of competent-looking officers in smart black uniforms, with shako and long shiny sword all complete. The American Air Attaché of Paris and London also arrived in his Vought with yellow wings decorated with white stars. Like the famous Belgian, Willy Coppens, he is able to "double" for the jobs in Paris and London because he uses an aeroplane. Maybe if all diplomats had to fly round and cover half a dozen jobs they would have enough work to keep warm, and tense international situations, due to diplomatic boredom, might be avoided. On the other hand, one politician flying from place to place with a mission, or bee in his bonnet, can start conflagrations in quite a number of places in a single day's flying.

Catching the Boat

There was an interesting air ambulance case on Friday when a lady on a stretcher made the trip from the Isle of Wight, *via* Heston and Croydon, to Holland by Spartan Air Lines, Inner Circle and K.L.M. The invalid could not have made the journey at all by surface transport. The Archbishop of York, who thinks we could do very well without aeroplanes, would, perhaps, care to make a note of this case. Some people missed a boat train to Folkestone at Victoria Station and went to Imperial Airways about it. For some incredible reason they would not fly all the way to the South of France in comfort but insisted on trying to catch the boat at Folkestone, a tough proposition considering the short stretch and the fact that the train had been gone some time and was reeling along on full throttle amidst the usual shower of red hot coals and smuts. Imperials were equal to the job, however, and a car took them to Croydon in thirty-three minutes. They arrived at 4 p.m. and were in the air at 4.1 p.m.—believe it or not. They were weighed almost with their luggage in their hands and then galloped to the Westland "Wessex" on the tarmac.

This only shows what can be done if you have not to bother with passports and things. The Customs examination at Croydon is swift, courteous and efficient, but thorough, because there are plenty of experienced men on the job. I

wish I could say the same of passport formalities. I have seen fully-loaded machines come in three at a time, bringing a total of, perhaps, sixty or more people. All foreign passengers pass one officer instead of being dealt with by two or three, and it sometimes takes thirty-five to forty minutes to get a passenger coach away to town. As it takes a coach at least the same time to reach London and as modern aeroplanes are doing the shorter journeys in ninety minutes, these unnecessary delays are ridiculous. Perhaps the Air Ministry will give this matter a little attention instead of fussing with silly regulations about tea and coffee in the Hall buffet.

General Hertzog came in by African Air Mail on Sunday, and on Monday, July 1, the Duke and Duchess of York flew to the Brussels *Exposition* in an Imperial Airways D.H.86, piloted by Capt. "Jimmy" Youell. There was an R.A.F. escort, which always amuses civil aviation people.

Considerable interest was aroused by the take off of *Scylla* at mid-day last Saturday, for the two centre engines were the new Bristol "Perseus" sleeve-valve engines—new, at any rate, to the air lines. When started up they appeared to be remarkably quiet.

Some time back there appeared a German machine registered D-AMIT, about which there is nothing personal, but now there is one which confronts you with D-AMYR.

Sabena started their service to Croydon, Ostend and Le Zoute last Saturday, and Tuesday, July 2, saw the inauguration of a week-end service to Le Touquet by Air Despatch, Ltd., on which the Avro 642 is used. There is a steward and a buffet on board, and morning coffee and afternoon tea is served with the compliments of the company. It is just one of those little things which passengers appreciate, and it will repay the company a thousandfold.

The week's good story concerns an official Air Ministry lunch given in the Airport Hotel.

After it was over the head waiter was summoned by an official—presumably the Controller of Bins and/or Trays, Ash. Qualified approval of the festivities was expressed, but it was pointed out that His Majesty's Government was unaccustomed to tapping its august ash into trays bearing the name of a proprietary brand of ale.

To those about to entertain Air Ministry officials this hint is of importance. Bottles should not bear such names as "Pommard" or "Mumm," and cigars should be of some nameless brand. In other words, and so long as no casualties occur, "Red Biddy," "Black Strap," and cooking brandy are safe wines to serve, and cigars can be made at home out of withered but quite wholesome horse-chestnut leaves.

A. VIATOR.

In Egypt

MISR AIRWORK'S summer service from Cairo to the resort of Mersa Matruh was reopened on June 23 with one service on Sunday, the machine calling, of course, at Alexandria. For the moment the new D.H.86, which arrived at Cairo on June 12, will be used on the daily Cairo-Alexandria service.

British Continental Opening

ON Tuesday British Continental Airways opened their new service to Ostend and Le Zoute with three departures daily in each direction. Mr A. P. K. Hattersley was due to fly the first "Rapide" over.

Early departures, incidentally, are to be made from the Continent on Monday morning so that week-enders can be back for business, and the service, as already reported, is extended to Brussels on Saturday and Sunday. The general agents of the company here are Messrs. E. H. Mundy and Co., Valsingham House, Seething Lane, E.C.3.

Tata Plans

SINCE the Government have not yet laid out an aerodrome in Bombay, Tatas will not touch Bombay during the nonsoon, but will divert their service *via* Poona. It is hoped, however, that the aerodrome, with a 600-yard concrete runway and wireless equipment, will be ready for use by November.

Tatas' future plans include a direct service to Tranvandrum from Bombay and a service between Madras and Colombo with a halt at Trichinopoly. All these developments are promised within the present year. Miles "Merlins" have, as already stated, been purchased for the Karachi-Madras service.

Ceylon's Aerodrome

IT is now officially stated that the Ratmalana landing ground in Ceylon will be ready for the Indian air mail service by the end of July or, at the latest, by the end of September. If Tatas are ready to start a service in July or August a special effort will be made to get the site prepared by the end of July.

To start with it is proposed to build only one hangar, and as the service develops the amenities of the landing ground will be increased until it becomes an aerodrome. The site covers 242 acres and is considered to be ample for all future needs.

Arrangements have been made by the Public Works Department in Ceylon to take possession of the Ratmalana aerodrome site immediately.

Developments in the West

JUST as soon as the projected municipal airport at Weston-super-Mare is fit for use Mr. Norman Edgar will start a ferry service from there to Cardiff. Three D.H. "Dragons" will be used on the route, which will be covered in a flying time of about ten minutes—as compared with the hour or more taken by steamer. The fares have not yet been settled, but these will probably be in the neighbourhood of 7s. return.

At the same time—probably early next year—a new line will be opened between Weston and Birmingham, using 140 m.p.h. machines. This will mean that the manufacturing city and the holiday resort will be within fifty minutes of one another. One feels that at this still comparatively early stage in internal airline development Mr. Edgar is right in concentrating on holiday services and on routes which show a very marked saving in time. His Bristol-Cardiff ferry, which runs six times daily in each direction during the summer, covers the distance in a matter of fifteen minutes.

The Cardiff-Bristol-Bournemouth service, which is operated twice daily in each direction and connects with the P.S.I.O.W. services to the Isle of Wight, is another typical example of the time-saver. Bristol, in any case, is now a useful centre for operations, as services connect it with some eighteen towns. The Le Touquet and Paris service, run during the week-end, is promising well, especially as the return journey is made on Sunday afternoon.

Norman Edgar (Western Airways), Ltd., have now opened a depot at Cardiff, and both a booking office and waiting-room are to be erected. Transport at Cardiff is, of course, included in the Bristol fare. Developments there have been largely assisted by Cambrian Air Services, with whom Western Airways is now in association.

The Graf Zeppelin in 1935

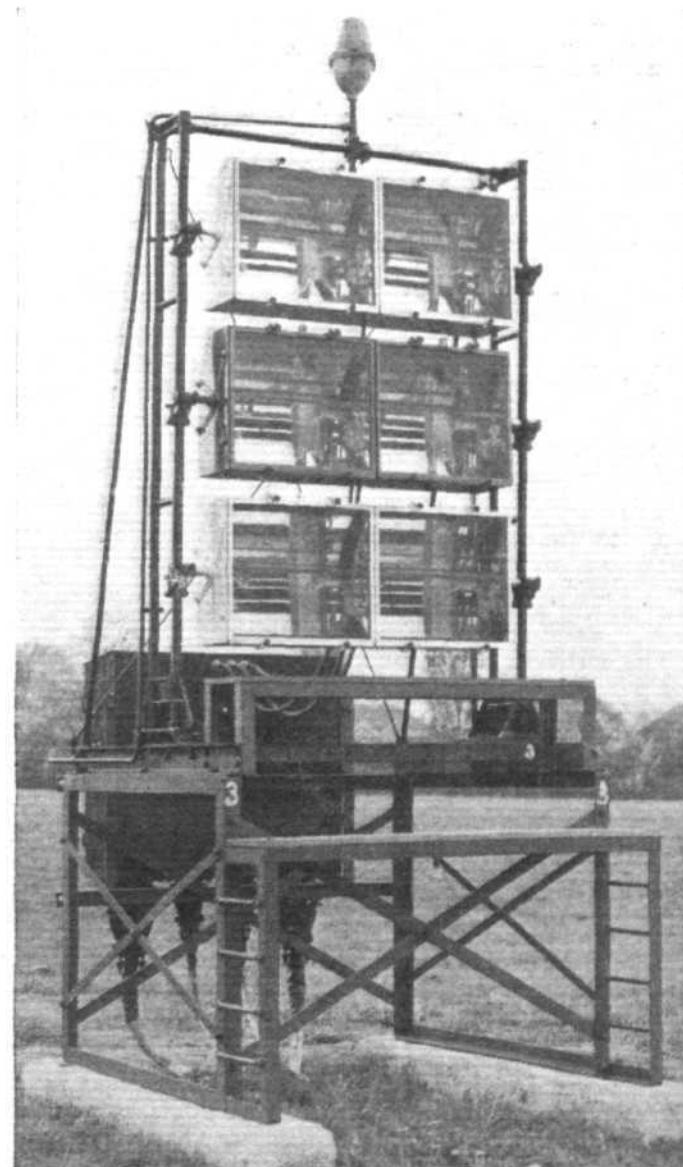
ON June 15 the *Graf Zeppelin* left Friedrichshafen on the first of its fortnightly trips to Pernambuco and Rio de Janeiro. The last summer "sailing" from Germany will be made on October 21. The Syndicato Condor Limitada carry passengers on to Buenos Aires from Rio in Junkers machines.

Long-distance D/F

ONE of the more interesting technical developments in connection with the recent flights of the Sikorsky S-42 across half the Pacific to Honolulu and Midway Island has been the long-range direction finder.

In the U.S., of course, the use of the radio beacon, mildly unreliable as it is under certain circumstances, has meant that D/F as we know it is almost unknown, though the "radio compass," a portable version of the same thing, has been brought to a state of comparative perfection. Direction finders are used on the Pan-American runs, in Alaska and on the China National routes.

Developed from that used by Col. and Mrs. Lindberg in their survey flight made two years ago, the direction-finding equipment used on the trans-Pacific flights works on fairly short wavelengths and is reported to have none of the faults previously experienced. Variable polarisation, for instance, experienced at night, has limited the range of the normal loop type to a matter of thirty miles or less. Working on a wavelength of 50 metres the new equipment has a reliable range of 1,800 miles at all times.



CROYDON'S NEW LIGHTING: One of the seven G.E.C. floodlights which are already in experimental operation on the Croydon boundary. They are entirely controlled from the tower and eight will eventually be in use.

COMMERCIAL AVIATION

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For the R.A.F. Display : The Dangers of Diplomatic Air Travel : Saving and Wasting Time : The "Perseus-Scylla" : New Services : Entertaining the Air Ministry

AS the R.A.F. Display date comes nearer air traffic people appear for the most part to quit work and to gravitate from all over Europe towards Hendon *via* Croydon. Directors, managers, chief engineers of firms from half a dozen countries came pouring in on the Friday and Saturday. Judging by the snappy way in which they moved, this invasion appears to act as a temporary tonic to jaded ground staffs.

Quite a number of foreign craft, mostly of Service types, also arrived, including two French, a Dane, an Italian, and the venerable tri-motor Fokker which is used by the Netherlands Royal Air Force as a kind of char-a-banc on these occasions. It disgorged a number of competent-looking officers in smart black uniforms, with shako and long shiny sword all complete. The American Air Attaché of Paris and London also arrived in his Vought with yellow wings decorated with white stars. Like the famous Belgian, Willy Coppens, he is able to "double" for the jobs in Paris and London because he uses an aeroplane. Maybe if all diplomats had to fly round and cover half a dozen jobs they would have enough work to keep warm, and tense international situations, due to diplomatic boredom, might be avoided. On the other hand, one politician flying from place to place with a mission, or bee in his bonnet, can start conflagrations in quite a number of places in a single day's flying.

Catching the Boat

There was an interesting air ambulance case on Friday when a lady on a stretcher made the trip from the Isle of Wight, *via* Heston and Croydon, to Holland by Spartan Air Lines, Inner Circle and K.L.M. The invalid could not have made the journey at all by surface transport. The Archbishop of York, who thinks we could do very well without aeroplanes, would, perhaps, care to make a note of this case. Some people missed a boat train to Folkestone at Victoria Station and went to Imperial Airways about it. For some incredible reason they would not fly all the way to the South of France in comfort but insisted on trying to catch the boat at Folkestone, a tough proposition considering the short stretch and the fact that the train had been gone some time and was reeling along on full throttle amidst the usual shower of red hot coals and smuts. Imperials were equal to the job, however, and a car took them to Croydon in thirty-three minutes. They arrived at 4 p.m. and were in the air at 4.1 p.m.—believe it or not. They were weighed almost with their luggage in their hands and then galloped to the Westland "Wessex" on the tarmac.

This only shows what can be done if you have not to bother with passports and things. The Customs examination at Croydon is swift, courteous and efficient, but thorough, because there are plenty of experienced men on the job. I

wish I could say the same of passport formalities. I have seen fully-loaded machines come in three at a time, bringing a total of, perhaps, sixty or more people. All foreign passengers pass one officer instead of being dealt with by two or three, and it sometimes takes thirty-five to forty minutes to get a passenger coach away to town. As it takes a coach at least the same time to reach London and as modern aeroplanes are doing the shorter journeys in ninety minutes, these unnecessary delays are ridiculous. Perhaps the Air Ministry will give this matter a little attention instead of fussing with silly regulations about tea and coffee in the Hall buffet.

General Hertzog came in by African Air Mail on Sunday, and on Monday, July 1, the Duke and Duchess of York flew to the Brussels *Exposition* in an Imperial Airways D.H.86, piloted by Capt. "Jimmy" Youell. There was an R.A.F. escort, which always amuses civil aviation people.

Considerable interest was aroused by the take off of *Scylla* at mid-day last Saturday, for the two centre engines were the new Bristol "Perseus" sleeve-valve engines—new, at any rate, to the air lines. When started up they appeared to be remarkably quiet.

Some time back there appeared a German machine registered D-AMIT, about which there is nothing personal, but now there is one which confronts you with D-AMYR.

Sabena started their service to Croydon, Ostend and Le Zoute last Saturday, and Tuesday, July 2, saw the inauguration of a week-end service to Le Touquet by Air Despatch, Ltd., on which the Avro 642 is used. There is a steward and a buffet on board, and morning coffee and afternoon tea is served with the compliments of the company. It is just one of those little things which passengers appreciate, and it will repay the company a thousandfold.

The week's good story concerns an official Air Ministry lunch given in the Airport Hotel.

After it was over the head waiter was summoned by an official—presumably the Controller of Bins and/or Trays, Ash. Qualified approval of the festivities was expressed, but it was pointed out that His Majesty's Government was unaccustomed to tapping its august ash into trays bearing the name of a proprietary brand of ale.

To those about to entertain Air Ministry officials this hint is of importance. Bottles should not bear such names as "Pommard" or "Mumm," and cigars should be of some nameless brand. In other words, and so long as no casualties occur, "Red Biddy," "Black Strap," and cooking brandy are safe wines to serve, and cigars can be made at home out of withered but quite wholesome horse-chestnut leaves.

A. VIATOR.

In Egypt

MISR AIRWORK'S summer service from Cairo to the resort of Mersa Matruh was reopened on June 23 with one service on Sunday, the machine calling, of course, at Alexandria. For the moment the new D.H.86, which arrived at Cairo on June 12, will be used on the daily Cairo-Alexandria service.

British Continental Opening

ON Tuesday British Continental Airways opened their new service to Ostend and Le Zoute with three departures daily in each direction. Mr A. P. K. Hattersley was due to fly the first "Rapide" over.

Early departures, incidentally, are to be made from the Continent on Monday morning so that week-enders can be back for business, and the service, as already reported, is extended to Brussels on Saturday and Sunday. The general agents of the company here are Messrs. E. H. Mundy and Co., Walsingham House, Seething Lane, E.C.3.

Tata Plans

SINCE the Government have not yet laid out an aerodrome in Bombay, Tatas will not touch Bombay during the monsoon, but will divert their service *via* Poona. It is hoped, however, that the aerodrome, with a 600-yard concrete runway and wireless equipment, will be ready for use by November.

Tatas' future plans include a direct service to Trivandrum from Bombay and a service between Madras and Colombo with a halt at Trichinopoly. All these developments are promised within the present year. Miles "Merlins" have, as already stated, been purchased for the Karachi-Madras service.

Ceylon's Aerodrome

IT is now officially stated that the Ratmalana landing ground in Ceylon will be ready for the Indian air mail service by the end of July or, at the latest, by the end of September. If Tatas are ready to start a service in July or August a special effort will be made to get the site prepared by the end of July.

To start with it is proposed to build only one hangar, and as the service develops the amenities of the landing ground will be increased until it becomes an aerodrome. The site covers 242 acres and is considered to be ample for all future needs.

Arrangements have been made by the Public Works Department in Ceylon to take possession of the Ratmalana aerodrome site immediately.

Developments in the West

JUST as soon as the projected municipal airport at Weston-super-Mare is fit for use Mr. Norman Edgar will start a ferry service from there to Cardiff. Three D.H. "Dragons" will be used on the route, which will be covered in a flying time of about ten minutes—as compared with the hour or more taken by steamer. The fares have not yet been settled, but these will probably be in the neighbourhood of 7s. return.

At the same time—probably early next year—a new line will be opened between Weston and Birmingham, using 140 m.p.h. machines. This will mean that the manufacturing city and the holiday resort will be within fifty minutes of one another. One feels that at this still comparatively early stage in internal airline development Mr. Edgar is right in concentrating on holiday services and on routes which show a very marked saving in time. His Bristol-Cardiff ferry, which runs six times daily in each direction during the summer, covers the distance in a matter of fifteen minutes.

The Cardiff-Bristol-Bournemouth service, which is operated twice daily in each direction and connects with the P.S.I.O.W. services to the Isle of Wight, is another typical example of the time-saver. Bristol, in any case, is now a useful centre for operations, as services connect it with some eighteen towns. The Le Touquet and Paris service, run during the week-end, is promising well, especially as the return journey is made on Sunday afternoon.

Norman Edgar (Western Airways), Ltd., have now opened a depot at Cardiff, and both a booking office and waiting-room are to be erected. Transport at Cardiff is, of course, included in the Bristol fare. Developments there have been largely assisted by Cambrian Air Services, with whom Western Airways is now in association.

The Graf Zeppelin in 1935

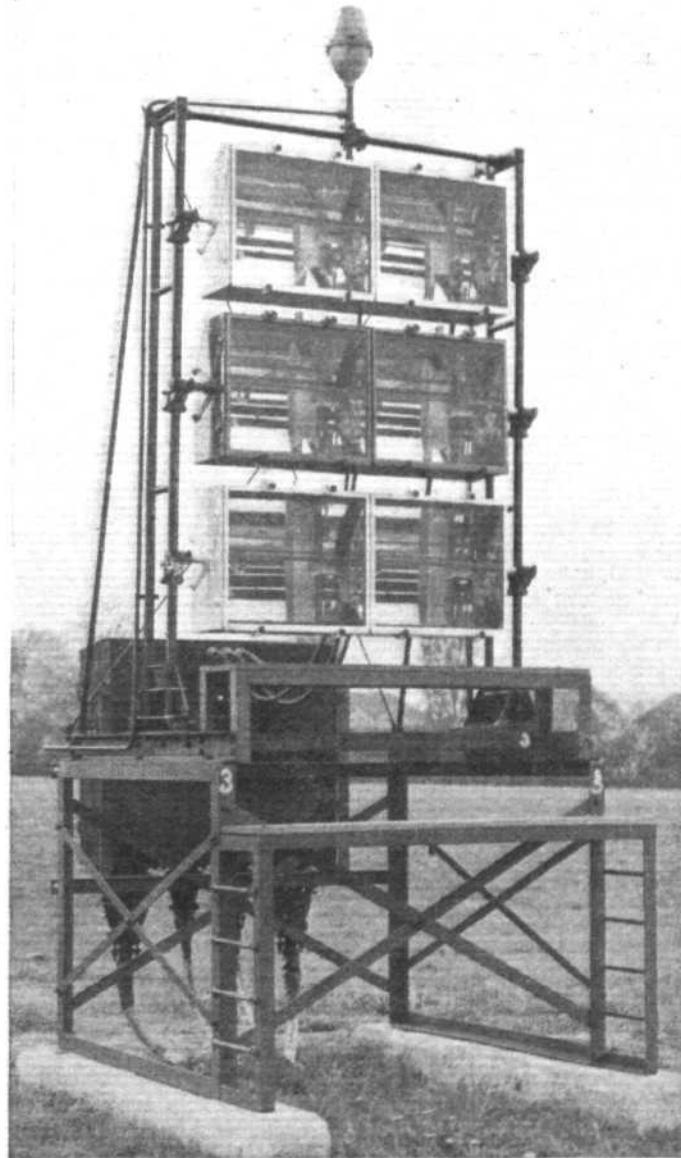
ON June 15 the *Graf Zeppelin* left Friedrichshafen on the first of its fortnightly trips to Pernambuco and Rio de Janeiro. The last summer "sailing" from Germany will be made on October 21. The Syndicato Condor Limitada carry passengers on to Buenos Aires from Rio in Junkers machines.

Long-distance D/F

ONE of the more interesting technical developments in connection with the recent flights of the Sikorsky S-42 across half the Pacific to Honolulu and Midway Island has been the long-range direction finder.

In the U.S., of course, the use of the radio beacon, mildly unreliable as it is under certain circumstances, has meant that D/F as we know it is almost unknown, though the "radio compass," a portable version of the same thing, has been brought to a state of comparative perfection. Direction finders are used on the Pan-American runs, in Alaska and on the China National routes.

Developed from that used by Col. and Mrs. Lindberg in their survey flight made two years ago, the direction-finding equipment used on the trans-Pacific flights works on fairly short wavelengths and is reported to have none of the faults previously experienced. Variable polarisation, for instance, experienced at night, has limited the range of the normal loop type to a matter of thirty miles or less. Working on a wavelength of 50 metres the new equipment has a reliable range of 1,800 miles at all times.



CROYDON'S NEW LIGHTING: One of the seven G.E.C. floodlights which are already in experimental operation on the Croydon boundary. They are entirely controlled from the tower and eight will eventually be in use.

Commercial Aviation**A Larger Douglas**

ALTHOUGH no performance figures are yet available, it is now known that the Douglas D.C.3 will carry twenty-four passengers for daylight operations and sixteen as a sleeper. It will have two engines of 900-1,000 h.p., automatic variable airscrews and automatic mixture control. Apart from the fact that the machine will be slightly bigger and the fuselage wider, the design will follow that of the present D.C.2.

Air Traffic Increases

DURING the first three months of 1935 Imperial Airways carried considerably more traffic than during the corresponding period last year. Passenger-miles were 3,830,609 last year and 5,884,234 this year—showing an increase of about two million. In the same periods freight-ton miles were 87,811 and 127,213.

"Heracles"-type machines have flown three and a half million miles during the last four years on all routes, and have carried 132,000 passengers.

In Central Asia

REGULAR passenger air traffic has commenced on a new line in Kirghizia, between Frunze, its capital, and the district of Susamyr, the largest mountain pasture lands in Central Asia.

Until now communications with Susamyr were possible only during six months of the year. In addition to carrying passengers the aeroplanes will bring provisions to Susamyr and will carry away butter, hides, skins and wool. The distance will be covered in one and a half hours, and the route crosses the Kirghiz mountain range.

A Limited "B" Licence

SINCE the G.A.P.A.N. held conference with the D.C.A., the Guild has circularised pilots concerning the possibility of a limited "B" licence. As a result of the enquiry a letter was sent to the Air Ministry proposing that holders of this suggested new licence should be restricted to instructional, test, demonstration and "internal" joy-riding, and that the qualifications should be similar to those at present demanded, but with the exception of blind-flying ability.

In the meantime the work of drafting a series of qualifications for an entirely new licence—a Transport Pilot's Licence—is going ahead, though the difficulty is increased by reason

of the fact that the second pilots (or first officers) are carried only by Imperial Airways, and the new man, therefore, has little chance, elsewhere, of increasing his experience in transport flying before actually being placed in charge.

Training in India

IN India the development of civil aviation has been a slow business because of financial stringency, and there is much leeway to be made up. There are, however, satisfactory signs in many directions of a determination to speed up progress. The recent duplication of the Imperial Airways' services, the prospect in the near future of four air mails in a week and the increase of traffic on the feeder lines have compelled the urgent consideration of schemes for the improvement of existing aerodromes, the construction of additional landing grounds, and the equipment of the Indian air routes for night flying. Equally important is the question of the training of large numbers of Indians.

The arrangement by which facilities were provided for the training of a small number of young men in England, with a view to their future employment in the Civil Aviation Department in India, has had some successful results, but the next few years will see a demand for far more qualified Indians as pilots, ground engineers, instructors, and aerodrome officers than are at present available, and the scheme for the establishment of an Aeronautical Academy in Delhi, which is now under the consideration of the Government, has not come a moment too soon.

This project appears to have been carefully thought out. It has been decided that the entire capital shall be raised in India and that there shall be a predominantly Indian directorate. The encouragement and support of the Government, provided certain conditions are fulfilled, is assured, and the closest co-operation between the Academy and the flying clubs throughout India is the essence of the scheme. In his letter to the Bombay Flying Club, which has had the organisation of an aeronautical school under consideration for some time, the Deputy-Director of Civil Aviation suggests that the various flying clubs should enrol a sufficient number of students to warrant the appointment of engineers to give them elementary instruction, and that at the end of each year a number of these students should be selected for entrance into the Academy.

Any suggestion that the Academy is intended to compete with the activities of the flying clubs is dispelled by the decision that the former will not undertake elementary training.

HERE AND THERE**At the Brussels Show**

AMONG the concerns exhibiting at the Brussels Exposition are the following:—Firth-Vickers Stainless Steels, Ltd., Imperial Airways, Ltd., Vickers, Ltd., Dunlop Rubber Co. (Continental), Ltd., and Sky Writing (Major J. C. Savage).

A "Drone" Club?

THE idea of using the B.A.C. "Drone" for inexpensive and interesting flying by qualified pilots has been in the minds of a number of people since this machine first made its appearance. The hire charge for such a machine should not be more than fifteen shillings an hour.

A reader is now endeavouring to start a small waiting list of founder members for such a club in the London district and is negotiating for the use of a suitable aerodrome. Such founder members would not pay a first subscription.

Those who are interested are asked to write, enclosing a stamped envelope and giving their qualifications, to BM/RELP, c/o Monomarks, Ltd., 188, High Holborn, W.C.1.

A Big Survey Job

AN important piece of aerial survey work is shortly to be undertaken by Aerofilms, Ltd., who have received an order from the Ordnance Survey to take photographs of an area of about 260,000 acres in the Midlands and to enlarge them for use as the basis of maps of 25 in. to the mile. This is for an experimental revision of some 270 Ordnance Survey sheets. A Williamson Eagle camera is to be used to take the vertical photographs, and the aircraft will be a special D.H. "Puss Moth" fitted with a P.B. automatic pilot to keep it on the extremely accurate and level course which will be required. H. Hemming and Partners, Ltd., obtained the contract and are co-operating with Aerofilms, Ltd.

A Company Reconstruction

THE well-known engineering firm of Rubery Owen and Company, which suffered the loss of Mr. A. E. Owen some little while back, has now been reconstructed as a private limited company under the title of Rubery Owen and Co., Ltd., with Mr. A. G. B. Owen as chairman and managing director.

Summer on the Road

THIS is the time of year when countless motorists are planning their holidays and tours, often a difficult matter without expert assistance. To all such to-morrow's special Summer Number of *The Autocar*—July 5—will help materially to solve the problem. A photogravure section depicting beauty spots of Great Britain, how to cover the best of the Lakeland Hills in a day, what constitutes the ideal car, hints on summer touring, and the latest news of the sport in news and pictures; these are among the features of a most attractive issue, which also contains full illustrated descriptions of the new six-cylinder series of Morris cars, which includes 16 h.p., 18 h.p., 21 h.p., and 25 h.p. models.

The Motor Cycle, our vigorous associated journal, which enjoys the largest circulation of any motoring journal in the world, publishes a remarkable Special Number to-day. In addition to an enlarged issue, giving all the news and views of two- and three-wheel motoring, a 32-page booklet of full paper size is presented with each copy. This booklet, profusely illustrated, is one of the most useful touring guides, in compressed form, in Great Britain. Every motorist, car driver, or motor cyclist should not only secure a copy, but keep the booklet handy on his vehicle for use when away from home.